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High Prices and Reclamation

A necessary corollary to the conclusion that wage rates will not decline to any marked extent in the near future is the continuance of the present high costs of materials. The one is the result of the other. This gives emphasis to the importance of reclamation—not primarily to secure materials not otherwise available during the war, but to save money. Obviously, the higher the first cost of an article, the more one can afford to pay for its reclamation. Prices have changed so rapidly during the last two years that it has been difficult to keep salvage methods revised in accordance with the conditions. While these rapid changes are largely over, the present bases of comparison are still far from those of pre-war days.

An Appeal for Co-operation

Confronted with a heavy decline in business and increasing costs of operation which are resulting in a deficit of about two million dollars per day, Director General Hines has issued an appeal to railway employees to enlist their co-operation in operating the roads more economically. This request is deserving of a most sympathetic response from the employees. They have been generously dealt with by the Railroad Administration. Their hours of labor have been reduced, their working conditions improved and their wages have been increased approximately one billion dollars per year. The employees can do much to aid the federal management in reducing expenses. By working more efficiently they can make possible the release of a considerable number of men; by using materials more carefully they can reduce the amount required; in short, they can eliminate waste in many ways if they set out to do so. It is only by co-operating in measures of this character that they can justify the continuance of the high wages now being paid them.

Tie Renewals Now and in 1924

One of the results of the recent shortage of ties is the insertion in the track of many ties untreated which will give a relatively short life. This condition has arisen largely because of the necessity of securing ties for immediate use, combined to some extent with the production of an unusually large proportion of ties of the classes which normally are treated before use. Regardless of the cause, the result will be abnormally heavy renewals in four or five years—and the roads will then have to absorb this additional charge in their operating accounts.

Don't Curtail Supervision

Adequate supervision is commonly advocated, but seldom found. Because of an endeavor to economize in supervisory forces, the roads commonly lose far greater amounts through the decreased efficiency of their employees. There is no point on the average railroad where a dollar will yield as large returns as in supervision. Yet in spite of the great turnover in maintenance labor during the last year, with its resultant increase in the number of inexperienced men, the universal unrest among the forces and the higher wage rates (making the elimination of lost time more than ever necessary) supervision has been

very generally curtailed. This has been brought about, not so much by a reduction in the number of officers as in the loading of additional duties on the existing supervisory forces. This has resulted especially from the increase in the amount of clerical work now being required because of the addition of new reports, etc. This tendency to reduce supervision is one which should be watched carefully.

EXPERTS SHOULD BE EMPLOYED

THE PRINCIPAL difficulties experienced in the maintenance of track today arise from inefficient labor. Over a period of ten years the wages paid to track labor has been advanced from 100 to 150 per cent. In the same interval the output per man per unit of time has decreased fully 50 per cent.

From this it is apparent that it is hopeless to expect relief solely from wage advances. If proportionate results could be obtained by paying the price to labor no one would object to the advances. It seems, however, that the remedy must be found elsewhere; for instance, by reducing the number of units of man power and supplying other means of doing the work. The men retained should be experts, recognized and paid as such, and held responsible for reductions in the unit costs of work. This they could accomplish by the utilization of labor-saving devices. It seems that the benefits from such a plan would be progressive. Improved methods of working would constantly suggest themselves and not only would existing machines be utilized and further developed but undoubtedly others would be perfected.

WHAT IS TO BE DONE ABOUT THE PAINTING?

ONE OF THE unfortunate results of the decision of the Railroad Administration to curtail maintenance expenditures has been a radical reduction in painting programs on a number of railroads throughout the country. The serious consequences of the general adoption of this policy will be thoroughly appreciated after reading the discussions of this situation on another page of this issue written by several men in close touch with this problem. Aside from the prospect of greatly increased maintenance costs when the painting is eventually resumed at some time in the future, the laying off of painters is effecting a disorganization of the maintenance painting crews. This promises to offset all of the improvement in personnel which it had been hoped to accomplish as a result of the marked increase in wages to painters secured during the past year.

However much this situation is to be deplored, responsibility of the master painter and his superiors does not cease with a statement of the consequences thereof. Their real duty is to consider seriously what can be done for the welfare of the structures under their supervision, under the circumstances, that is, in the light of the limited appropriations for painting at their disposal. In the first place appearances must be accorded an entirely minor consideration. All of the appropriation for painting must be expended in such a way that every cent of it will be used in the preservation of the structures. In general it would seem that more attention must be paid to the structural steel work, whether in buildings or bridges than to woodwork, for the relationship between the decay and protective coating is not as clear with wood as it is in the case of steel.

The carrying of this policy to an ultimate conclusion would mean that less money would be spent for the painting of buildings than of bridges, and would result, no doubt, in a somewhat unpainted appearance of a great many station structures. But with these the possibilities that a delay in painting may result in an irreparable damage is not nearly so serious as in the case of the bridges.

Assuming that painting is to be done only for the purpose of preserving the structures where the need of such preservation is most apparent, it follows that the master painter must be denied the satisfaction of doing a complete job on the structures. Rather he will be compelled to do a large amount of spot painting to take care of the worst places on a great many or a complete single coat on such as are most in need of the complete painting. The pursuance of such a policy will, undoubtedly, be distasteful to most master workmen who derive a great deal of satisfaction from the completion of a job well done, but under the present circumstances it behooves them to consider the responsibility which is theirs in making the most of the resources placed at their disposal.

ARE THE ROADS BEING ADEQUATELY MAINTAINED?

IS THE GOVERNMENT fulfilling its obligations to the owners of the railway properties with respect to the maintenance of the roads? The director general says it is; officers of the corporations are equally positive that it is not. The correct answer to this question is of vital interest to the owners of the railroads and to the maintenance of way officers responsible for their upkeep.

In addressing Congress on the subject of railroad control on January 4, 1918, President Wilson stated that "It is right and necessary that the owners and creditors of the railways, the holders of their stocks and bonds, should receive from the Government an unqualified guarantee that their properties will be maintained throughout the period of federal control in as good repair and as complete equipment as at present." In the standard contract which the Government has offered the roads this guarantee was modified to require that the Government maintain each road so that it will be "returned to the company at the end of federal control in substantially as good repair as it was on January 1, 1917," provided that an annual expenditure for such purpose equal to that of the test period, equated for changes in costs of labor and materials should be considered as full compliance with this obligation. As interpreted by the Government, this clause gives the administration the option of taking whichever alternative is most favorable to it.

The Railroad Administration is evidently satisfied that it is adequately maintaining the roads, even to the point of exceeding its contract obligations, for early in June the director general stated to a congressional committee at Washington that his "best judgment of the situation as a whole is that at the present time we are fully up to our contract obligations in respect to maintenance of roadway and structures and equipment." A few days previously on May 27, he went even further and wired the regional directors to curtail maintenance expenditures because "it is important that steps be taken to avoid the danger of the government spending more for maintenance than is required by the contract."

It is difficult to reconcile this attitude with the almost universal opinion of maintenance officers in both administration and corporate employ that the roads have been under-maintained under federal control. Many of these men are much concerned over the situation. They point to the shortages of 20 and 18 per cent in the renewal of rails and ties, respectively, last year as typical of conditions in general. They further emphasize the fact that labor was at the lowest efficiency last year and did not yield a return commensurate with the expenditure, either in dollars or hours of work, measured on pre-war standards. Most of the curtailment has been in such work as

painting and policing the right-of-way which, while necessary, can be postponed temporarily on occasions, but must be made up later. Railway men in direct charge of maintenance work and familiar with it are firmly of the opinion that the amount of work of the various classes which has been deferred is large in the aggregate and will tax the ability of the Administration to complete in the few remaining months of federal control.

This difference of opinion is an unfortunate one which should not be allowed to continue. It must be met on the broad basis of fairness and justice to both parties. The burden of proof rests with the federal administration since it is managing under contracts of its own making properties which were taken over without the request or permission of their owners.

WANTED—A UNIT OF MAINTENANCE

WHAT IS THE unit of measurement by which the adequacy of the present maintenance of the railway properties can be determined? On its selection depends the settlement of the controversy which has arisen between representatives of the Railroad Administration and the corporations.

The dollar has been the most commonly accepted unit in the past. Using this basis we find that in 1918 the expenditures of the Class 1 roads for maintenance of way and structures were $653,868,000, an increase of 46.7 per cent over those for 1917, while for the first three months of this year they aggregated $171,787,000, an increase of 38.8 per cent over those for the same period of 1918. However, such a comparison is of little service in ascertaining the relative amounts of work done, for the dollar has lost its value as a unit of measure in this period of rapidly increasing costs of all commodities.

The Railroad Administration has come forward with another unit—the ratio between maintenance of way expenditures and operating revenues. In an order directing retrenchment in expenditures issued by the director general on May 27, it is stated that this ratio for the test period was 12 per cent, for the calendar year 1918, 13.3 per cent and for the first three months of 1919, 15.3 per cent and the roads were directed to reduce this ratio for June to the average yearly ratio for the test period. The use of such a ratio presupposes that there has been no change in the relationship between the two components —operating revenues and maintenance of way expenditures during the intervals under comparison. But this condition has not prevailed. Both units have increased, although in widely different degrees, so that it is evident that the use of such a unit is hardly less inaccurate than that of the dollar itself. Its accuracy is further weakened by the fact that the test period was one of rapidly increasing revenues, while the present is one of equally rapid decline.

It is evident that some other unit must be devised if we are to be able to compare the upkeep in two periods of widely varying conditions. The maintenance of a railway consists in the repair or renewal of its constituent units. Therefore, it would seem that the most accurate measure of upkeep possible would be the comparison of the units of materials and labor furnished. This could be compiled for all units consumed, although all practicable purposes could be served by the proper selection of representative units for comparative purposes, such as tons of rail relaid. There could be no uncertainty about such a unit, for it is tangible, readily defined and independent of prices and varying traffic conditions. It is important alike to the government and the owners of the roads that units be adopted which are capable of accurate measurement and are fair to each party without regard to whether they support one contention or the other.

LETTERS TO THE EDITOR

THE PROBLEM OF THE LABOR UNREST

Chicago, Ill.

TO THE EDITOR:

Maintenance forces, like the great majority of other railroad employees, are a part of a relatively permanent organization. Construction forces, on the other hand, are more temporary in character. Maintenance forces should, therefore, lend themselves more readily to a solution of the labor problems, once a basis for a true solution can be found.

There is such a widespread recognition of the serious unrest in labor circles that every thoughtful man in the camp of both employer and employee is taking it more and more into account in his plans for the future. There is not only a recognition of this serious unrest, but a recognition that a crisis is rapidly approaching. Among the more radical in the labor camp this unrest takes on a decidedly revolutionary character.

This turmoil lessens the efficiency of labor and consequently increases the problems of the employer. This is, of course, a detriment to both employer and employees, as it absorbs energies in opposing each other that should be spent in producing the product on which they work.

A more kindly and better feeling between the employer and employee is absolutely necessary before conditions can improve. We sometimes forget how large a part our feelings play in the game of life. They are the connecting link between our thoughts and our actions. If the employee does not feel kindly toward his employer he is not going to render loyal service. It does not matter whether or not there is just cause for that ill feeling, the results are the same.

The railroad officers, down to and including most of the foremen, take an interest in the railroad company's affairs over and above the wages they receive. They are concerned in the success of their work. Among the employees below the foreman there has been a growing lack of interest in the progress of the work. There has probably never been a time when loyalty of service was at as low a stage as it is at present.

The employer and his officers fail to recognize for the most part his responsibility for this state of affairs. The employee likewise fails to see where he is at fault. He fails to see in his "catch him and skin him" attitude toward his employer, that he is playing the game unfairly. The employer and his officers have the most to give in bringing about a better feeling and should set the example by making the first move. Under the United States Railroad Administration the officers who direct the work and the employees who serve should recognize that they are fellow-employees in the government service. Unfortunately, this recognition is only so many words and not a matter that is put into action.

The mutual recognition of service to the Government need not lessen the discipline in the maintenance forces. If the officers from the top clear down to the foreman will make it clear to his fellow-employees that he expects to give every man a square deal the first step will have been taken to solve the problem. Take that step and provide the means to prove it to the men and then put the men on their honor to render loyal and more efficient service and a long step has been taken to solve the problem of employer and employee permanently.

F. E. KING,
District Carpenter, Chicago, Milwaukee & St. Paul.

How an Old Masonry Arch Bridge Was Rebuilt

Some Interesting Facts Concerning an Unusual Structure That Was Recently Strengthened

THE RECENT reconstruction of an old stone masonry arch bridge on the Chicago & Alton brings to light some interesting facts concerning the history of an old structure which is unique in the annals of early railway construction in the Middle West. Not only is the type of construction unusual for the time and locality, but an account of certain details of the design, the faults they developed and the measures which were taken to overcome them during the last 20 years, constitute an interesting and instructive treatise on the strengthening of stone masonry structures.

This bridge, which is known locally as the Big Piasa Creek bridge, is located on the Roodhouse-Godfrey line of the Alton not far from Delhi, Ill. Built in 1881, it probably replaced a pile trestle that had carried the traffic across the Piasa creek ravine in the 15 years subsequent to the original construction of the line in 1866. As originally built, it consisted of five semi-circular arches of 40 ft. span having a total length of 260 ft. and a total height above bottom of footings of 60 ft. The distinctive feature of the design was its extreme slenderness. The structure was only 8 ft. wide from the springing line of the arches to the underside of the coping. Below the level of the arches the piers and abutments were battered out to a width of 12 ft. 6 in. at the tops of the footings. Slenderness of construction was also carried out in the width of the piers parallel to the track since they were only 5 ft. thick at the springing line, battering to a width of 9 ft. 6 in. at the footing.

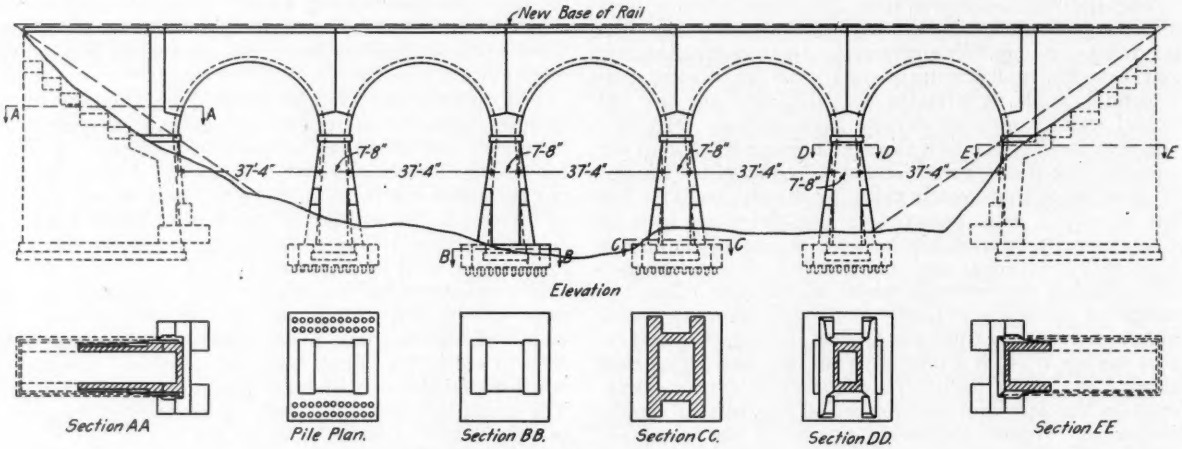
The abutments consisted essentially of plain wall construction carried back into the embankments a sufficient distance to develop the required embankment slope. As far as is known the spandrels over the tops of the arches and the two abutments as well as the piers are solid masonry construction, so that the top of the structure widened by a two-course coping presented a solid masonry floor 10 ft. wide for the support of the track. The track construction consisted essentially of sills placed transversely at intervals on the top of the masonry on which were supported four lines of 8-in. by 16-in. stringers carrying a regular bridge trestle floor.

The bridge was constructed of limestone masonry, which had suffered considerable cracking of the stones at the end of the first 20 years. A drawing made in 1901 showed the cracks in the pier stones together with a considerable spalling of the pier belt courses at the springing line of the arches. The coping on which the track was supported was also suffering disintegration.

In 1904 the deck was replaced by a more permanent and stable construction. The upper coping course of masonry was removed in sections 11 ft. 3 in. long and replaced by slabs of plain concrete of equal length and 8 ft. wide, crowned ½ in. along the center line. These slabs were concreted in alternate units to avoid interference with traffic during construction. When all was completed the old trestle deck was replaced by 12-in. by 8-in. by 9-ft. 6-in. ties supported directly on the concrete slab and secured against displacement by bolts anchored in cast iron sockets imbedded in the concrete.

With this limited alteration, the bridge continued in service without further change until 1911, when excessive lateral vibration pointed to the need of a greater lateral stability under the increased train loading. Further weathering of the pier masonry also indicated that jacketing was necessary. Careful investigations of the structure indicated the desirability of enclosing it completely with a casing of concrete and jacketing of the piers to a point about five feet above the springing line was undertaken at once.

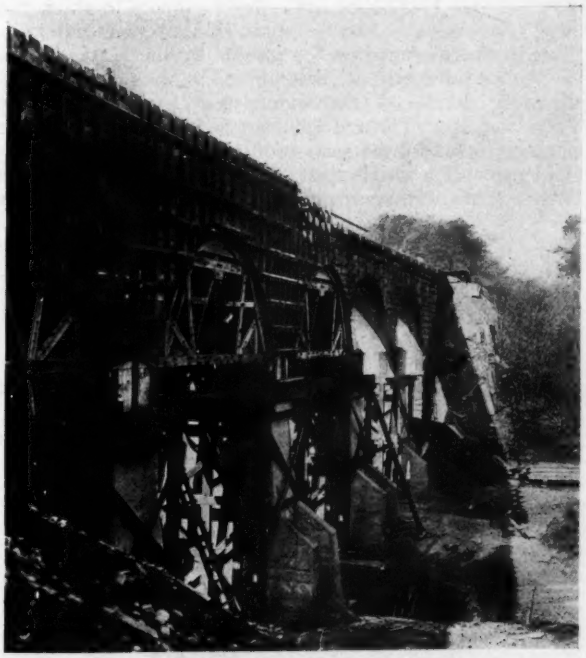
The nature of the jacket placed on the piers is shown on the drawing. The concrete was made 2 ft. 4 in. thick on each end of the pier, while given a beveled thickness



General Elevation of the Bridge

on the two sides, which varied from 1 ft. 4 in. at the top to 2 ft. 10 in. at the bottom. In addition to this jacket further lateral stability was given to the piers by providing two buttresses 14 ft. high and 5 ft. wide at the bottom, extending from each end of each pier, the outer faces of these buttresses being placed in the same plane as the two sides of the pier.

To afford support for this new construction as well as to give additional support for the existing masonry, a heavy footing was provided, entirely surrounding the old masonry footing. The old masonry was supported on natural foundation, but it was decided to place the new footing on piles, of which 44 were driven at each pier. These were placed in groups of 22 under each end of the footing, that is, beyond the limits of the two faces



A Construction View

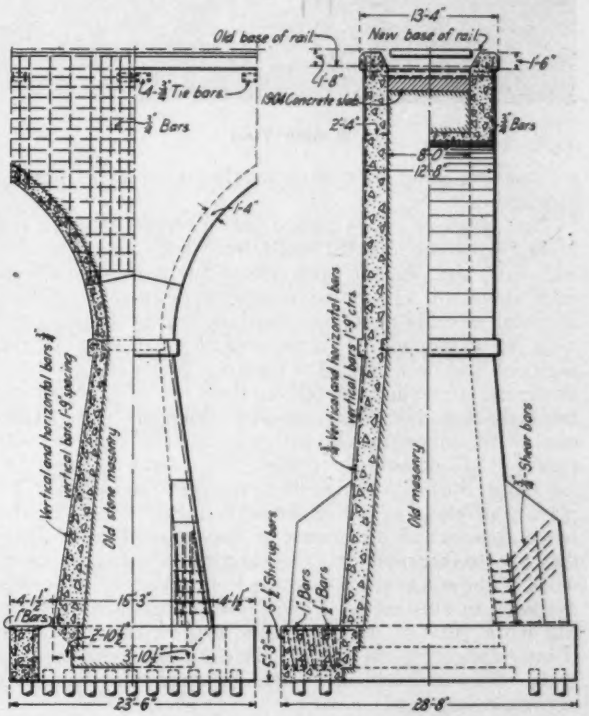
of the bridge. As a consequence, both the footing and the lower portion of the jacket around the pier had to be designed with the use of considerable reinforcement so as to distribute the load to these two groups of piles. Reinforcement was also placed vertically and circumferentially in order that the concrete would function adequately as a surrounding protection and stiffener for the old work.

FINAL REINFORCEMENT

It was decided to complete the reinforcement of the structure in 1918 after inspection disclosed the formation of some well defined cracks in the arches, some of which extended through the concrete floor slabs placed in 1904. This latest work consisted in provision for a jacket for the two abutments in addition to a continuation of the jacket previously placed, over the two sides and around the arch ring.

The jacket over the arches and spandrel walls was made 2 ft. 4 in. thick over the sides and 1 ft. 4 in. thick over the intrados of the arches. The new concrete was bonded to the old masonry by dowels set in the stone work at intervals of 3 ft. horizontally and 4 ft. vertically, in addition to concrete ties 10 in. deep by 1 ft. 6 in. wide, placed at intervals of about 10 ft. across the top of the old bridge and reinforced with four ¾-in. bars tying the two side walls together. These side walls were finished with a coping 1 ft. 10 in. high projecting 4 in., so that the bridge has a finished top 13 ft. 4 in. wide. This top was also made 1 ft. 4 in. higher than the old base of rail to accommodate a raise in grade of that amount. Vertical construction joints on the center lines of each pier and one 2 ft. 6 in. back from the face of each of the old abutments served to divide the new concrete wall jacket into convenient construction units.

The jacket placed over the abutments was made to correspond with that placed on the pier and the superstructure except that the thickness of the concrete on the two sides of the tail walls was reduced to 1 ft. 6 in. to save material. The footings for the abutments were also placed on natural foundation at a somewhat higher elevation than the old, while the footings for the two side walls along the tails of the abutments were stepped up the embankment slope to avoid excessive excavation. In addition to the use of dowels and ties over the top of the bridge, the jacket for the abutments was bonded into the old work by taking out stones at intervals along the stepped footing of the side walls, taking pains to see that the new concrete filled up the voids left by these stones. As in the case of the previous reinforcement the



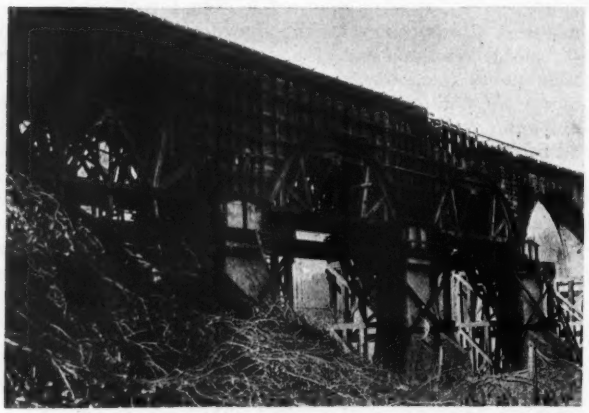
Details of the Reinforcement

new jacket was adequately reinforced in the outside face to provide for any deformation resulting from load conditions or temperature.

CONSTRUCTION METHODS

Work on this last stage in the strengthening of the bridge was started in August, 1918. A concrete plant was set up at the south end of the bridge. A material platform 200 ft. long was built on the west side of the embankment, the north end of this close to the bridge being used as a site for the concrete mixer, directly opposite a cement house built on the east side of the track. South of this cement house on the east side of the track, a

spur track of two-car capacity was installed, the cars of stone and sand delivered on this track being unloaded into storage piles on the platform directly opposite. Water was supplied to the mixer from a pump placed at the edge of the creek, while further preparations included the placing of a plank floor on top of the bridge ties, both inside and outside of the rails, for the entire length of the bridge. The forms and centering were framed on a level place in the creek bottom near the south abutment. The construction force consisted of 25 men, of whom 12 to 15 were form carpenters. However, trouble was experienced in obtaining and holding a force of this size,



A Side View

so that the gang was often smaller than these figures indicate.

The concrete work above the springing line of the arches naturally divided itself into nine units, one for each arch and one for each side of the two tail walls of each abutment. In actual concreting a further subdivision was made in arranging the daily run by allowing the work to be stopped when the concrete wall work of the arch unit had been carried at least one foot above the level of the old arch ring, completing the work of that unit on the following day. The concrete materials were delivered to the mixer in wheelbarrows and the concrete was transported out onto the bridge in the same manner, being dumped off the bridge deck and into the forms. The placing of the concrete underneath the arch ring as the work approached the crown of the arches offered some difficulty to insure that no voids were left under the stonework. The solution for this was to revert to the practices followed in closing the crown of the arch in tunnel lining work; that is, to use rather dry concrete and ram it into place from the sides. Since the old arch was only 8 ft. wide no particular difficulty was experienced in accomplishing this.

The operation of trains during the course of the work was controlled by the placing of a 5-mile-per-hour slow order, amplified during the time the concrete work was in progress by an order requiring all trains to stop upon arriving at the site of the bridge and not to proceed until given a signal by the inspector or superintendent of construction.

It was first planned to provide forms and centers only for three of the arches with the idea that two of the sets could be used a second time on the two remaining arches. However, the season grew late before the forms could be released, so it was decided to supply additional formwork for the last two arches to avoid any delay in the concrete work. The last of the concrete was placed on December 24, at which time some of the formwork had already been removed, but forms for the last two arches were allowed to remain in place all winter, being removed during the month of March, 1919.

As reconstructed, the bridge provides for ballasted track, the two side walls extending a sufficient distance above the old bridge floor to provide a receptacle for the ballast. The bridge floor was given a coat of bitumen waterproofing before the ballast was placed.

The latest reinforcement of this bridge has been conducted under the general direction of H. T. Douglas, Jr., chief engineer of the Chicago & Alton, and W. F. Rech, bridge engineer. J. E. Schwaab, resident engineer, supervised the work of the contractor, Stresenreuter, Cotton & Co., Chicago.

A NEW DERAIL ACCESSORY

ONE OF THE RECENT developments in track appliances is a one-tie stand for operating derails. This has been placed on the market by the Hayes Track Appliance Company, Richmond, Ind., and is designed for throwing derails of the sliding type manufactured by that company. These derails are held in position either open or closed by the seats of the guide box. As a consequence only a simple throwing device is necessary. The earlier types of operating stands for this purpose have

The Derail Stand

been made to span two ties, but it has been found that a simpler form requiring the use of only one tie could be produced that would fulfill all requirements as to strength and efficiency. The newer type saves the extra length of timber on one tie, there are no gears and the parts are few. The stand is fitted with sheet steel vanes and a cold rolled steel lamp staff. The crank is a drop forged eyebolt threaded to provide adjustment for the throw of any derail. When ordinary vanes are used the top of the lamp tip is about 20 in. above the tie. The connecting rod furnished has an adjustable screw jaw on each end and ⅞-in. turned pins; it is of a length to place the center of the lamp staff 3 ft. 6 in. from the gage side of the rail, but this may be varied to meet requirements.

"There is hardly anything in the world that some men cannot make a little worse and sell a little cheaper, and the people who consider price only are this man's lawful prey."

WILL IT PAY TO INCREASE SUPERVISION?

Experience of Two Officers Indicates That Increased Clerical Duties Cause Neglect of Field Work

ONE OF THE SUREST WAYS to reduce expenses is to increase the supervision. The higher the wage rate or the lower the efficiency of the labor employed, the greater is the need of supervision. These conditions apply in railway work just as directly as in other industries. The wages of maintenance forces have been doubled within the last 15 months. In the same period the efficiency of the forces has decreased. Therefore, the need for more and better supervision is self-evident.

At the same time maintenance officers are being burdened with a greater number of reports than ever before, which clerical work is requiring a large part of their time and is taking them from the work on the line. The work of maintenance officers, particularly of supervisors, roadmasters and master carpenters is in the field; their immediate responsibility is the direction of the gangs engaged in the maintenance of tracks and structures. When they are required to give any considerable portion of their time to other duties, their forces lose the benefit of their trained supervision and the work suffers accordingly. There is a feeling at present on the part of many maintenance officers that the efficiency of their forces is suffering seriously because of decreased supervision at the time when the needs are for even greater supervision. This sentiment is shown in the discussions which follow.

RECORDS VERSUS PERSONAL SUPERVISION

By Track Engineer

For some time special emphasis has been placed on cost data, proper records, and the necessity of watching maintenance of way results from such data. Admitting at once that such records are necessary and of real value, it is believed that in carrying out this idea proper steps are not being taken in that certain supervisory officers, such as division engineers, roadmasters and supervisors, are being held to their desks overseeing the preparation of these records, and as a result are losing that intimate knowledge of conditions and the essential feature of personal contact with their men.

The real supervisor is a teacher. To instruct others necessitates, on the part of the teacher, an intimate knowledge, not only of principles but of methods, and a clear knowledge of the conditions under which the work must be performed and also of difficulties that may arise as the work progresses. It also calls for a knowledge of the capacity of those instructed and that the pupil understands and makes an effort to put into practice what he is told.

No records or cost data will enable the supervising officer to get results to compare with that of personal contact with the men in the field, first, because he cannot know the conditions under which the work is done, and, second, the foreman lacks the necessary instruction and help that he receives when the supervisor is on the ground and able to discuss, correct and impress his views. Assuming, however, that the supervisor is entirely familiar with all conditions and is in every way qualified to issue his instructions without going on the ground, he is still at a great disadvantage because his foreman cannot understand fully written instructions and usually resents receiving them. If they do not understand it is an even chance they will not write back for further instructions and will go about their work in their own way and possibly in the wrong way. The records in time will show this up, of course, but the money has then been spent and one has started a post-mortem that usually irritates the foreman and the supervisor and takes a great deal of the time of each.

In many cases criticism made from records is unjust, and does not disclose the real cause of failure to secure results, so that this again tends to produce feeling between the supervisor and his men. The facts are that when a road forces its supervisory officers to spend a large part of their time in the office, it is putting an additional burden and responsibility on the foremen and is expecting the supervisor to take responsibility he cannot properly discharge.

In view of this it is believed that in the preparation of records and cost data the supervisory force should be relieved of any detail work in connection with them and that on each division there should be established a statistical bureau in charge of a man trained for such work, such bureaus to work up all data for the maintenance of way, the maintenance of equipment, and the transportation departments. This will allow the line supervisory officers to continue to keep in close personal touch with the work and the men and at the same time have made available for them valuable cost data and other records.

Too much stress cannot be laid on the necessity of supervisory forces keeping in close personal contact with the men; nothing must be allowed to come in that will make this less in the future than in the past. The development of late years has been in the opposite direction and just now it is especially so. Is it not probable that some of the unsatisfactory results observed today are the result of this? Is it not time that steps are taken to see that this tendency is checked?

MAKING CLERKS OF FOREMEN EXPENSIVE PRACTICE

By John Evans

Division Engineer, Michigan Central, Detroit, Mich.

The ever-present and most important duty of roadmasters, assistant roadmasters, supervisors, assistant supervisors and foremen is the proper handling of emergency and routine work in the maintenance of the track. All other matters should be subordinated to this. At the present time, when there is a great deal of deferred work to do, and when labor and material costs are so high, the superior officers of these men should see that the amount of work given them, which would interfere with the carrying out of track work, is made as small as possible.

Among the things to be guarded against is the tendency to make errand boys out of these men; the tendency to require an unnecessary amount of correspondence, and the tendency to favor construction work in preference to maintenance.

Office work is distasteful to most track men. They are not trained for it, consequently what they do of it is done at high cost in money. Furthermore, when attending to correspondence they are being kept away from their most important work, which work is the only kind they are fitted to do in a manner justifying the salaries which they are being paid. While careless handling of any reports or correspondence which it is absolutely necessary for these men to take care of is inexcusable,

an effort should be made to reduce such reports and correspondence to the lowest possible quantity.

In cases where the number of gangs working in close proximity will warrant it, I believe that the relieving of roadmasters and foremen of accounting work entirely is worth consideration. This work could, I believe, be taken care of by men working out from the accountant's office who would go about among the different gangs keeping records for the making up of pay rolls and material accounts. The roadmasters and foremen would be responsible only for the hiring of the forces and the handling of the track work. The reports would come into the office in better shape, the actual cost of the work would be less, considering the actual money value of the time involved in doing it, and the outside supervising force could give its entire attention to the prosecution of the track work. The men handling the accounting work in the field could also, in making their rounds, obtain information needed in answering a great deal of the correspondence which the roadmaster or foremen would otherwise have to take care of.

Where there is considerable construction work to do, arrangement should be made for handling it by other than maintenance forces, both as regards the furnishing of labor and supervision.

The size of a roadmaster's or supervisor's territory should be such that his knowledge of conditions thereon is correct, up to date, and derived from personal inspection. The men working under him are not, as a rule, capable of giving him entirely correct and complete reports, either verbally, or in writing. A roadmaster with one assistant covering a small territory is a more desirable arrangement than having a roadmaster's territory larger and divided among more than one assistant.

In making inspections the roadmasters or assistants should, wherever possible, be accompanied by a man who will be directly connected with the doing of such work as the inspection shows to be necessary. This will do away with making notes and writing letters and will avoid misunderstandings which are apt to arise when such matters are handled by correspondence. It will also hurry the carrying out of the orders.

In some localities the proper employment of laborers while the foreman is making his inspections presents some difficulties. In some cases of this kind a trackwalker having facilities for making small repairs might take care of part of the inspection, leaving the foreman working with his men.

Efficient and ample supervision insures the doing of the most important work first, and also insures the proper distribution of the available men and material. In this way it counteracts labor and material shortage whether such shortage is due to actual scarcity and high prices, or due to orders to retrench.

While it is a generally recognized principle that the proper way to reduce expenses is to increase the supervising force, it is, unfortunately, not the usual custom for railroads to make such increase for that purpose.

Constructing a Track Layout in Close Quarters

BY W. F. RENCH

WHILE INSTALLING a system of tracks leading to a new ten-bay section of a concrete roundhouse, which eventually will be extended to form an entire circle, replacing an inadequate brick structure, certain new problems in track construction were presented by reason of the confined location, and especially because the rail was of the heaviest section and had to be unloaded and placed by hand. The plan of the layout shows the limited facilities that were available for receiving and storing the materials, and indicates the importance of the proper selection of the place of unloading, as well as the sequence of arrival of the supplies. In general, the rails, frogs and joint material were received on the right side of the layout and the ties and switch timber on the left side. The temporary surrender of two tracks of the old system, which were only used for storage of wheels or an occasional tender, supplied the required space for the ties. The cinders were mainly received through the engine storage track, but occasionally a third track adjacent to the two used for tie storage was also available.

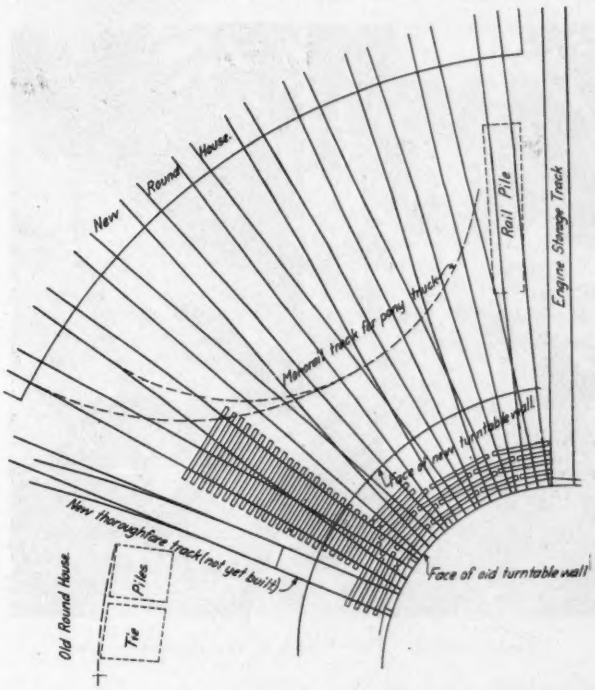
A part of the development at this point is the substitution of a 110-ft. turntable for the present 75-ft. table, which is barely able to turn the longest locomotives of the ordinary traffic. As the successive sections of the new house are built it is planned to construct as much of the new circular wall as fronts the completed portion. The excavation between the old and the new walls is bridged with 12-in. by 12-in. yellow pine stringers, laid in contact on the shorter arc and spread 4½ in. apart on the longer arc. The new roundhouse is designed to provide 13 ft. centers of tracks at the face of the house, and the tracks have a standing room of 103 ft. between the walls within the house. The rails along the pits through the new house are carried on 7-in. by 9-in. oak ties bedded in the concrete of the side walls. Standard spikes were used to secure the rails in place, these being applied after holes ½ in. in diameter had been bored in the ties with pneumatic augers. Care was taken to make the line of the rails exactly true, both to the engineer's line and in detail, before the boring was done.

The tracks leading to the new house are placed in pairs, overlapping at the old wall just one-half the distance between centers of rails, and diverging by means of No. 10 frogs placed for convenience just beyond the new circle wall. When the new table is in use the frogs will be eliminated and the tracks will be lined straight. Each turnout has a separate set of switch ties which were laid on a predetermined scheme with the overhang of the ends somewhat shortened to avoid dovetailing. The switch ties were of 7 in. by 9 in. yellow pine, fully tie plated. Each pair of tracks is symmetrical about a line drawn between the center of the turntable and the center between the two tracks within the house. A string stretched along this line was useful for setting the frogs and for placing the switch ties, which were centered upon this line and laid at right angles with it. It was also useful in establishing the reversed curves behind the frog by means of data scaled from a plan on a scale of ⅛ in. to 1 ft.

While the pairs of tracks are made to overlap just one-half the gage between centers of rails, the theoretical location would have made the overlap a few inches less. This would have rendered difficult, if not impracticable, the design of a pocket to receive the bar lock of the present table, which is located exactly in the center of the track. A slot 1¼ in. wide was cut into the lock, and both sides of the jaw as well as the top and bottom were slightly beveled. This enabled the lock to engage the web of the rail of the track twin to the one being used. To assure the rails remaining in position head plates, pat-

terned after those used in slip switch work, were constructed to tie together each set of four rails. This work was done in the mechanical department shops, which also furnished assistance in modifying the joints required with frogs. The splices used were the continuous type and are too wide to enter the space between the rails at the toe of the No. 10 frog, making it necessary to cut off a part of the base of the splices. This was done economically by the use of the acetylene torch at the nearby reclaiming plant, the normal function of which is the repair of worn-out switches and frogs to render them fit for yard use.

The compass of the layout being small, it was not deemed practicable to let the entire ballasting of the tracks await the opportunity of dropping cinders from cars run



Layout of the Work

over them when laid. There would have been certainty of a distortion of the line and a probability of fracture of the rails. A grade was, therefore, established by depositing a 6-in. bed of ash pan cinders wheeled in barrows from cars left standing in one or the other of the two available tracks. The grade was kept 1½ in. low, so that a surface raise only was needed to place the tracks at their final height after being fully ballasted in the regular way. As care had been taken to obtain proper line before ballasting, little lining was then required. The placing of this level grade was of incidental use in other ways and fully justified the additional expense of its preliminary establishment.

The cutting of the rails for the entire layout was done on a comprehensive scheme. It was planned to lay the tracks through the house immediately to permit the mechanics to complete their work, and the 16-ft. 6-in. pieces necessary to break joints were cut first. The location selected for the frogs required pieces of rail 18 ft. 5 in. long between the toe of frog and the turntable. They were cut from 33-ft. rails, and the 14-ft. 7-in. pieces remaining were used for the initial rail on the opposite side of the track. This gave proper staggering of the joints and also avoided the presence of joints within the guard rails. It further served to employ these lengths to advantage and save so much in waste of new rail. This policy was followed consistently, so that at the conclusion of the work there was a minimum of scrap rails on hand.

The tracks having been laid through the house and the initial rails at the turntable end being established, it only remained to determine the lengths of the closing rails between the turnouts and the house. This was done readily by a careful use of the steel tape. As each rail was cut it was appropriately marked and delivered near the point where it was to be applied. The drilling of the cut rails was done in the track by the use of ratchets with 24-in. handles operated by one man. Two rods with a hook on one end and a nut on the other and a splice bar furnished a seat for the drill and obviated the spiking of the ties, as is frequently done.

In the cutting of the heavy rails, which weighed 130 lb. to the yard, the orthodox method of chiseling and breaking by a fall was found to be impracticable. It is not possible to put a sufficient number of even the strongest men on the end of such rails to raise them to the height required for breaking by a fall. The method most effectual with the shorter cuts was to score deeply the perimeter of the base and the bottom half of the web and continue cutting into the middle of the bottom of the base until fracture resulted. In cutting the 16-ft. 6-in. pieces the method that gave the best results was to chisel in the manner above described, support the two ends by wooden blocks and continue chiseling into the web, while pressure was brought at the middle by a long lever. The available rail bender was of the "Jim Crow" type, and was useful where the cuts were about 12 ft. in length. It was not possible to break the rails by the force of the bender alone. The greatest tension possible was applied and then cutting was continued into the outside of the base until fracture. If this was delayed the bender was changed to the other side of the rail and the same method applied. In all the cutting care was taken to mark the cuts exactly at right angles with the rail.

The tempering of the cutters received close attention. The first twelve from the shop failed before a single cut had been made. The blacksmith was induced to try different tempering until a proper degree of hardness was obtained. This was found to result when the tool was heated to a cherry red and then slowly cooled in water until a mean between a light and a dark blue color appeared. The contour of the dressed tool was made as nearly as possible that of the tool direct from the maker. While the use of an acetylene torch could have been obtained for cutting and boring the rails, it was felt that the lack of a neat section of the end and a somewhat variable location of the bolt holes rendered this method undesirable for the purpose in hand.

The means followed in delivering the rails from the pile to their places in the house was somewhat novel. Since at least 22 men are needed to carry 33 ft., 130 lb. rails, and then frequent rests are required, it was decided to use the pony truck as much as possible. The 14-ft. 7-in. rails were set on their bases directly upon the prepared grade and roughly in an arc of a circle from the rail pile to a point a few inches short of the final location of the first rail inside the house. This line of rail was extended as rails were brought up until the end of the pit was reached. The rail for the adjacent side of the track was brought in on the same line and placed at once upon the wall from the back to the front of the house. The first line of rails was then pulled forward a few inches into place and a new arc was laid to reach the next bay.

It was necessary to provide a walk the entire length of the pits for the men on one side of the rail. This was

done by cutting pieces of 2-in. by 12-in. plank a little shorter than the distance between the bases of the rails when set in position on the wall. These were spaced between 5 and 6 ft. apart and a line of 2-in. by 12-in. plank land upon them. When the second line of rail was being moved across the pits the planks were removed and the short pieces placed where the men carrying the rail across would need to walk. The 60 rails were placed in this manner by a picked gang of 15 men in less than two working days without a mishap of any kind.

The rails had been loaded with a locomotive crane at the source of supply, but could not be similarly handled at the layout by reason of the difficulty involved in bringing the crane to the location. The cars were gondolas with sides 4 ft. high. It was not thought safe for the men to lift the rails to this height, and they were elevated on short wooden skids inside the cars and dropped upon skids of old rails outside the cars. The car loaded with the frogs and guard rails was also a high gondola and safety considerations made imperative their unloading by a crane. As this material was received after the switch ties were in place, they were set at once by the crane close to their final location in the track.

AN INGENIOUS DITCHING MACHINE

By William S. Wollner

Assistant to the Chief Engineer, Northwestern Pacific, San Francisco, Cal.

As a result of a ditching problem presented to the maintenance of way department of the Northwestern Pacific, a special form of equipment was developed which accomplishes a considerable saving of labor. In the Eel River canyon, which is traversed by this road, sliding material was filling up the ditches and

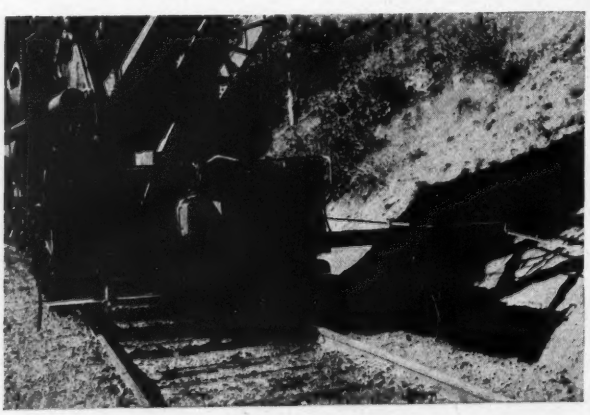
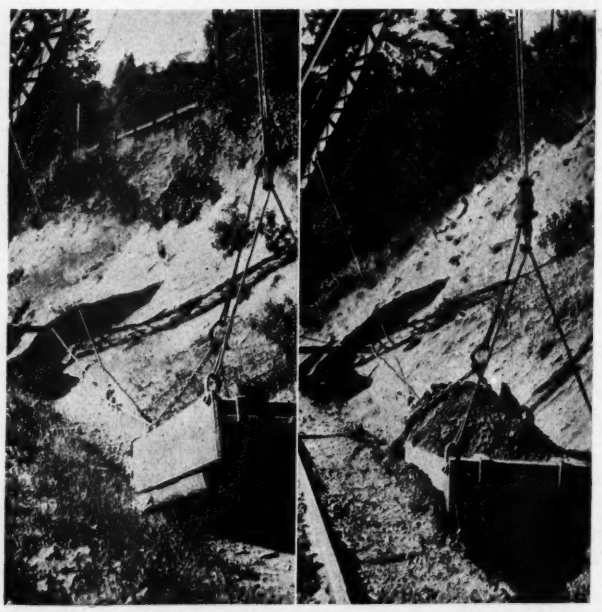


Fig. 1. Rail Attached to the Crane for Hauling the Bucket

the large quantity of water to be handled by these ditches during the rainy season made it necessary that they be cleaned out thoroughly. The road has as a part of its work equipment two 12-ton locomotive cranes and it occurred to J. G. Butler, foremen of work equipment, that these cranes could be fitted up to clean these ditches with the help of a drag-line bucket. His idea was essentially to fasten a boom to the body of the crane so that the bucket could be hauled along the ditch parallel to the track. The equipment was first prepared for this use about two years ago and has been in almost constant service ever since, so that there has been ample opportunity to demonstrate its value.

A 75-lb. rail about 20 ft. long was attached to each end of the car body, and this rail is used to regulate the distance of the ditch from the track. A one-inch cable is attached to the rear of the car and runs through a hole at the outer end of this rail to a hook on the bale of the drag bucket; a monkey line from the crane also runs to the bale of the drag bucket and is sued to hold the bale in position. This is shown in Fig. 2, which is a picture of the drag bucket getting into position for ditching. After the drag bucket has been placed in this position the crane moves backward until the bucket has been filled, as shown in Fig. 3. If the ditching is being done in a side cut the crane boom is swung over to the clear side where the drag bucket is in position to be dumped by the holding line.

In the case of a through cut the crane may be run to the end of the cut before the drag bucket is dumped, or



Figs. 2 and 3. Two Views of the Bucket in Use

the bucket may be emptied into an air dump car and the material disposed of later.

On the Northwestern Pacific all cranes are self-propelling and equipped with air pumps and reservoirs so that dump cars may be handled without other assistance. Where material is encountered in ditches too hard to be handled by the drag bucket, a rooter plow is attached to the bucket and dragged through the ditches to put the material into condition to be handled by the bucket. The ditching is done with a regular crane crew, consisting of a crane engineer, fireman and one helper. With this crew in side hill work, that is, where there is a ditch on only one side of the track, the average progress is about one track mile per day. Patents upon this device are pending.

A CORRECTION

In the issue for June, page 207, reference was made to the completion of two timber-treating retorts for installation at the Chicago & North Western treating plant at Escanaba, Mich., and the statement was made that these retorts, which were 113 ft. long and 6 ft. 2 in. in diameter, were believed to be the largest timber treating retorts ever installed in the United States. Investigation has since proved that this statement is wrong and that there are numerous retorts in operation in this country larger than those mentioned above.

Failure to Protect Structures in Time Results in More Expensive Work Later

RAILROADS HAVE ALWAYS been lax in the painting of their structures. There are, of course, notable exceptions to this rule, but exceptions they are, nevertheless. In recent years the long war period, with its ever-increasing costs, together with anticipation on the part of railway officers for early reduction in prices, led to a chronic postponement of painting which culminated in 1918 in very serious curtailments because of the scarcity of materials. Now when materials and labor are available the extensive painting program which is so very necessary is threatened with extensive reductions because of a tendency toward reduced maintenance expenditures.

This is a serious matter, especially for steel bridges, and with a view to a thorough understanding of the grave consequences of the deferment of painting programs, we present below five discussions of this subject. The first comprises a foreword by an expert with long experience in the inspection of steel bridges. The other four are the statements of practical railway painters.

CONSERVATION OF STEEL STRUCTURES

By Edward Godfrey

Structural Engineer, Robert W. Hunt & Co., Pittsburgh, Pa.

For the want of a nail the shoe was lost and all the rest of it down to the battle that was lost. Not long ago the writer saw a bridge that had failed, dropping three cars loaded with humanity into the river bed. Fortunately the drop was not very great vertically or a frightful disaster would have resulted. A bucket of paint, applied in the proper place and time would have avoided this potential sacrifice of hundreds of lives to carelessness.

A structure, like an automobile, may be an asset or it may be a liability. It is not enough that a structure be bought and paid for, it must be cared for as well. The writer has seen bridges that had to be reinforced at great expense or had to be replaced at still greater expense and all because they had never been painted after they were once completed and accepted from the hands of the fabricators.

When a structure approaches a point where it is in need of replacement, it is really going through a process of depreciation, whether the need of replacement is the result of deterioration or of inability to carry safely the increased loads in common use. It behooves those responsible for structures to know to a certainty whether or not their structures are depreciating or have depreciated, also to know whether or not attention or reinforcement may forestall this deterioration.

Some materials, such as steel, deteriorate from the outside, while others, such as wood, may deteriorate both from the outside and the interior. There are certain portions of a structure where defects are most apt to be found and where deterioration is most likely to be intensified. It is these matters that call forth the skill of the inspector or engineer who makes the examination, and it is in such matters where experience counts for the most. It seems to the writer that the present is a good time for those who are responsible for the safety of structures to look about and see what is the present value of those in their care.

THE CURTAILMENT PROGRAM FROM A PRACTICAL STANDPOINT

By Chas. Ettinger

Master Painter, Illinois Central, Chicago, Ill.

The issuance of an order at this time of the year to stop all painting provokes an opinion in the mind of the practical man that painting is for some reason not given the consideration it justly deserves, although it surely contributes its share to the furtherance of safety and economy. Painting work on steel structures is especially important and if proper advantage is taken of all practical points, a considerable saving can be effected during a full painting season.

Outside painting is seasonal work and to secure full benefit for men and material, it should be started as early as the weather will permit. If work is started too late in the season, the completion of all or part of the allotted program may either necessitate carrying operations into cold and freezing weather or require an increase in the forces beyond a point of practical advantage. The first is gambling with satisfactory results and the latter means working with inexperienced men.

If only part of the season's work can be done and some must be carried over, the cost of cleaning the steel later will be greatly increased; in badly corroded structures the cleaning cost is over 50 per cent of the total. Also the value and life of certain members of the structure may be threatened by excessive corrosion. A delayed or deferred program is certain to entail increased expense or serious trouble.

Curtailment measures in some cases at least appear to be carried beyond the point of good judgment. On a certain girder bridge some of the floor beams were renewed recently and the painters had just started work on them when the work was stopped and the new steel now stands exposed to weather and the smoke from another road which crosses underneath without even one coat for protection. When work is resumed later this job will, of course, receive preferred attention, but in spite of all that may then be done some of the vital parts will be out of reach, as, for instance, the joints between the angles and

the beams or between them and the girders. Moisture with sulphurous gases emitted from engines are surely getting in their destructive work all this time, while a priming coat would have protected the new steel at least for a time.

This policy invites attention to another matter which also is given little recognition, that is the trouble of breaking in new men each time when trained men who have given satisfaction are dismissed. A great many of them (usually the best ones) cannot be secured when again needed and the new ones must be hired and broken in. Of course, the opinion prevails that any tradesman, if proficient in his line, delivers 100 per cent results from the start on railroad work. However, this is an error, for railroad standards differ in a great many ways from the general customs and practices and it takes some time before new men pick up the additional knowledge. Painting means preserving, and the work is not a mere fad, but an actual necessity and if men in charge of it are not given the proper support they are bound to lose heart and interest in their work.

THE COST OF DELAYED PAINTING

BY H. B. WILSON

Maintenance of Way Master Painter, Bessemer & Lake Erie, Greenville, Pa.

It's a proven fact that the appearance of well painted railway bridges and buildings has a psychological effect on the public and employee without taking into consideration the feeling of security it gives the owners to know that their valuable structures are covered with a tough, elastic paint film that keeps out the weather and disintegrating gases. The old saying, "a stitch in time saves nine," is the absolute truth in regards to repainting at the proper time, for I have found that failure to repaint buildings and steel structures in season has cost at least three times as much in money and wear and tear on the men as it would have cost had the work been done at the first showing of paint decay.

For example, the paint on a steel structure of any kind starts to decay in the course of time and rust specks appear on the surface. How easy it is to take some light rigging, a fine wire brush, a good grade of paint and a few men, and wire and dust the lightly rusted surface, following with a coat or two of paint, and secure a good, smooth, clean job. On the other hand, let things go until the rust specks have become general corrosion and it will be necessary to use more men, heavier rigging, twice as much paint, and a noise like a busy session in a boiler shop. The result is a rough looking and weaker structure, and all at a cost of three times the amount that would have been incurred if the structure had been taken care of on first signs of paint disintegration. I have personally assisted in painting a 60-ft. girder at the proper time at a total cost in material and labor of $25, and again I have supervised the cleaning and painting of a similar girder that had not been attended to in season at a cost of $80, or a loss of $55 to the owners, a 5 per cent weaker girder and not as lasting a paint film as the $25 job. The entire roofs of roundhouses have been renewed, all because the steel trusses had not been paint protected at the proper time. The cost could have been reduced by thousands of dollars if a few hundred dollars had been expended for paint and applied at the proper intervals.

On wooden structures the situation is much the same. Combinations of different oils, pigments and gums, as we know (when applied to wooden surfaces properly) preserve the surfaces on buildings and fixtures of railways, which are abused more and need more upkeep attention than elsewhere because of heavy traffic vibrations, natural carelessness of passengers in transit and the hurry of employees to avoid delays to traffic. As an example, take the lower parts of station interiors (natural wood), which are subject to continual rough usage and if not refinished at the proper time soon become unsightly and germ laden and cannot be brought back to their original condition at three times the cost to refinish when the varnish film first showed defacing. A broken varnish surface allows dirt to penetrate to the bare wood, which cannot be bleached back to its natural color without excessive cost.

On the exteriors of wooden houses or stations that have been left unpainted for a period long enough to destroy the paint film and allow dampness to penetrate the wood, one will find warped weather boarding, spreading joints, loose nails and warped porch floors, making it necessary for carpenter renewals at a heavy cost. All this could have been averted by the timely use of a linseed oil paint.

WHAT IT MEANS TO DELAY PAINTING

BY W. I. FRENCH

Foreman Maintenance of Way Painters, New York, Ontario & Western, Middletown, N. Y.

The painting of bridges, stations and other structures, including signals and signs, constitutes an important detail of maintenance of way work. It preserves the structures and when properly done a great deal of economy is effected. However, the present attitude toward painting seems to indicate an indifference toward this most essential work.

It is a custom with railroads when it is necessary to make a reduction in their maintenance forces to reduce the paint force first. Where this practice exists many bridges are gradually being eaten away with rust and the buildings are decaying, thereby producing a condition which can only be corrected after a great amount of labor on the part of the painters before the structures are in proper condition to apply paint.

When a bridge begins to rust it also begins to weaken, because rust is like a cancerous growth which is continually working and destroying. Similarly when the large scales form a certain amount of strength is taken from the bridge due to the reduction in section of the metal. Something must be done to check the rust. It is then up to the painter to scrape, wire brush or sand the steel and remove as much of the rust as is possible before applying the paint.

In many cases the season is so short from the date the work is started on the bridges that one can give them only one coat of paint, which will perhaps be the only coat which they will get until they are in much the same condition as before being painted. For this reason in most cases bridges should not receive less than two coats of paint. If the bridge receives two coats the second one is a protection to the first coat, as it seals and protects the steel from atmospheric conditions that would otherwise affect the one coat of paint. The cost to clean the bridges that are allowed to get in bad condition may be three times as much and in some cases more than it would cost to paint them in season. Since labor is the major item of cost it seems very poor economy to let them get in such condition.

Buildings and other structures built of wood, instead of rusting will decay if not kept properly painted. It seems a fallacy to permit a station or building which costs a large amount of money to go to ruin when by keeping it well painted it can be preserved for years. If people would only stop and think for a minute of the amount of work it necessitates to get a building into condition to paint after the old coat has begun to peel, I think

fewer structures would be allowed to get in such a condition.

After a building begins to peel the only practical procedure before painting is to burn off the old paint down to the wood. If this method is not used it will continue to peel, whereas if it was given one coat of paint every four years it would keep the building in good condition at a reasonable cost. It would always look well and be in a good state of preservation.

The United States Government spends thousands of dollars each year for painting and experimenting with paints for the benefit of its own paint work and that of the public at large. One will find very few public buildings that are not painted. The government finds it more economical to keep them well painted than to allow them to go to destruction. This policy could well be adopted by the railroads.

WORK THE YEAR ROUND WOULD SIMPLIFY MATTERS

BY A. E. WILSON

Master Painter, New York, New Haven & Hartford, Hartford, Conn.

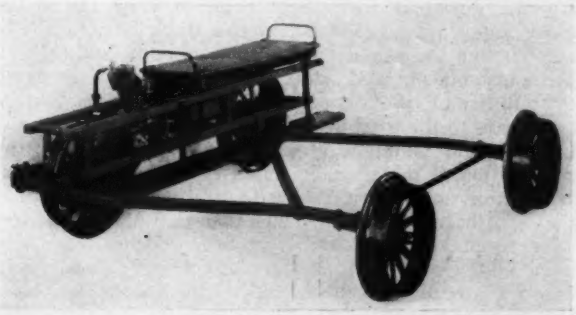
The practice of hiring men in the spring and laying them off in the fall is poor economy. Owing to the fact that some roads employ the men only for six or seven months a year while they can work two months longer with contractors, there is not much inducement for them on railroads. Aside from the shortness of the season, house painters do not like bridge painting, as they consider it dirty and dangerous. Painting on railroads is a trade by itself. Some people think anyone who climbs can paint on the road. The work of the novice is pretty costly at times, as he spoils a large amount of labor and material before he learns how. He must be broken in, not only to protect himself, but the public also, from spilling paint and dropping planks or other tools and leaving planks, ladders, ropes and paint pots where the public may suffer soiled clothing or bruised shins. If the work was steady the year round the foremen could keep the new men employed on the buildings, signals, crossing signs and switch targets and gradually break them in on bridge painting as they got more familiar with railroad work. But there is plenty of need for the trained painter in any event, since he must watch to see that the green men avoid the things they should not do, also tell them how to apply the paint under railway conditions. If railroads kept men employed the year around the matter of keeping structure properly protected would be simpler and more economical.

TWO IMPROVED MOTOR CARS

FOLLOWING A STUDY of the performance of its motor cars, the Buda Company, Chicago, Ill., has made certain modifications in the design of two of its cars which are of particular interest as illustrating what improvements can be introduced after a study of the conditions under which the cars are operated. These two motor cars differ from the older designs only in the frame construction, the idea being to make them safer and more practical in use and more suitable to the purpose for which they are intended.

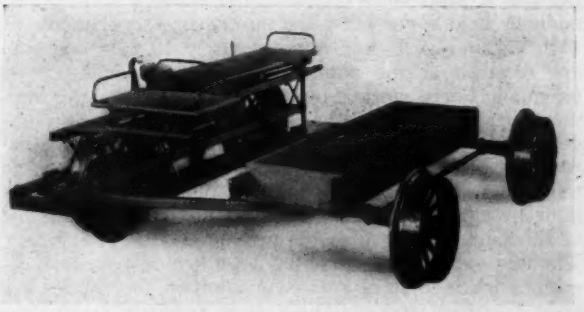
The type known as No. 210 is a modification of Model 10-NH, in which the raised portion in the rear of the operator's seat which formerly housed the gasoline tank, batteries, coils and tools is brought down flush with the rest of the seat to make a more convenient place for the second passenger. The batteries and coils are now located between the sills under the front portion of the seat which is hinged, thereby enabling the operator to examine these parts for loose connections and coil adjustment while the car is in motion, if this is found necessary.

The car shown in the illustration as No. 12C is a modification of the older design No. 12A and follows the same general frame construction as car No. 210 except that square tubular steel is used for the sills instead of wood. One change in this latter type of car is in the position and shape of the guide arms which are attached to the under side of the lower sills instead of the top of the upper sills. This, with the simple guide arm brace running from the front guide arm to the rear part of the car, provides a better arrangement of the tool tray or for any other purpose for which the guide arms may be used.



The No. 210 Type

For convenience in shipping the cars by train baggage, the guide arms with the wheels attached to them may be easily removed from the frame of the car. An additional feature has been provided in car No. 12C in the form of a compression release operated by a lever extending above the seat on the right hand side. This makes it convenient for the operator to start the car from the rear end while pushing it. These cars are equipped with single-cylinder, four-cycle engines, with sprocket drive on the front wheel. The gear reduction between engine and wheel is 4½ to 1, and is adjusted with the maximum speed of the engine to obviate excessive and dangerous speeds of the car while developing the full power of the engine at a relatively low speed of the car. The transmission is equipped with a friction mounting of the wheel sprocket whereby the sprocket automatically slips when the engine is started or when for any reason it is brought to a sudden stop. This slipping effect is also of assistance to the engine when starting under heavy loads or against strong grade or wind resistances. It is understood that under favorable conditions the No. 210 cars will average 100 or more miles per gallon of gasoline and 200 miles per pint of lubricating oil, while the No. 12C cars will operate about 85 miles per gallon of gasoline and 150 miles per pint of oil.



The Model 12C Has Steel Tubing Sills

PICKING MONEY OUT OF THE SCRAP PILE

The Reclamation of Track Fastenings Shows Big Economies on Several Roads Which Have Given It Thorough Trial

IN THE NOVEMBER and December issues of the *Railway Maintenance Engineer* the reclamation of rail as practiced in the plants of certain railroads was discussed. From an investment point of view rail is the most important single item in the track structure. In comparison, the smaller units, such as bolts, spikes, etc., seem insignificant and while the importance of securing the full life of rail is apparent because of the relation its cost bears to the total investment in the structure for the same reason it might appear that the results of the reclamation of these smaller units would be unimportant. In practice, however, it has been found that their reclamation is of hardly less importance than that of rail. Moreover, results can be secured with little expense for equipment and it is the purpose in the following discussions to draw attention to the results of such reclamation on several roads.

THE LACKAWANNA RECLAIMS MUCH MATERIAL

The reclamation of track scrap on the Lackawanna is not carried on as a separate enterprise. Rather it may be said to be incidental to the operation of a frog and switch shop which this road has maintained at Dover, N. J., for the past six years. This shop is operated by the engineering department as a distinct roadway enterprise. Its principal function is the manufacture of roadway supplies, including frogs, switches, repair parts for roadway machines, etc. In this manufacture it is possible to utilize second hand material extensively and the logical source of supply is the roadway scrap. Consequently, all such scrap, except rail, is shipped to this plant, the usable material sorted out and utilized and the remainder held for sale by the purchasing department.

In an average month approximately 18 cars of scrap are received at the plant. To prevent congestion, a scheme has been worked out which provides for the shipment of scrap from particular sections of the line on predetermined dates. By this arrangement the flow of materials to the plant is continuous and in comparatively uniform quantities. This permits the unloading to be done by a small regular force at a low cost per car and at the same time insures the prompt release of the cars. The wisdom of this course has been demonstrated on occasions when, for one reason or another, the routine has been disturbed and cars have been received faster than they could be handled by the regular force. In such cases cars were held under load until extra gangs could be brought in to unload them, which was then done only at a marked increase over the normal cost per car. During the unloading there is no effort made to grade the materials, although similar articles are, of course, unloaded together. In the case of the small scrap not requiring special treatment, the usable material is recovered as the scrap is being loaded for sale. Four men are employed in this work, two men picking out that which is usable as the other two men load the scrap. This arrangement results in important savings in time. The materials recovered from the scrap include frog and switch material, switch stands and parts, and track fastenings. In this article only track fastenings will be considered.

TRACK FASTENINGS

During 1918 the track fastenings recovered from scrap at this plant included 3,506 lb. Mayari steel track bolts, 1 in. by 5 in.; 51,331 lb. of Mayari steel track bolts, ⅞ in. by 5 in.; 3,000 lb. of steel track bolts, ¾ in. by 4⅛ in.; 3,957 lb. Weber track bolts, ⅞ in. by 6½ in.; 313 kegs of drive spikes; 171 kegs of screw spikes; 1,200 Weber insulated joints; 8,900 creepchecks and 630 rail braces. The scrap value of the track bolts recovered was $617.94 and the labor charge for reclaiming was $1,090.16, making a total cost of $1,708.10 for material worth $4,297.85 if purchased new, the profit from the operation being $2,589.75. The scrap value of the spikes was $2 per keg and the cost of sorting, straightening, etc., was approximately $1, making a total cost of $3 per keg for drive spikes having a value new of $8.17 and for screw spikes of $13.40. The total saving due to reclaiming spikes in 1918 was $3,457.41. The value of the Weber joints if purchased new was $7.50 each. The scrap value plus the labor cost to reclaim them was $3. As 1,200 of these joints were reclaimed, the profit from this operation was $5,400. The profit from reclaiming the 8,900 creepchecks was $1,068 and from the 630 rail braces $477.75, making a total profit in 1918 from the reclaiming of bolts, spikes, Weber joints, creepchecks and rail braces of $12,992.91.

METHODS AND EQUIPMENT

For several years past it has been standard practice on the Lackawanna to use screw spikes in main tracks. As the drive spikes are released from track they are shipped into the reclamation plant with the other track scrap. In sorting the material the drive spikes are graded into three classes—those suitable for further use without special treatment; those suitable for treatment, and scrap, which is made up chiefly of the spikes which are badly throat cut. The first class goes directly into kegs for reshipment. The spikes requiring treatment are first taken to a 350-lb. air-operated hammer equipped with a straight-faced die. Two spikes are placed on the die at one time and struck once with the hammer. Then they are turned over and hit on the opposite side. From the hammer they pass to the tumbling mill, where all scale and rust is removed before they are kegged for shipment. These spikes are used in side and industrial tracks, where they answer the requirements as well as new ones.

All screw spikes received at the plant are reclaimed except those with damaged threads. Bent spikes are straightened by hand rather than in dies, as it has been demonstrated that the variation in pitch of the thread prevents a true meshing and that method of straightening has been abandoned as impractical. For this purpose a simple device has been adopted, consisting of a piece of rail bored to receive the spike and held by a vice. To straighten the spikes they are started into the hole and when binding occurs they are struck with a hammer until they pass freely into it. To correct damaged heads they are subjected to heat, placed in a drop die and struck with

a hammer. With the straightening done and the damage to the heads corrected the spikes go to the tumbling mill, where the rust is removed. They are also given a bath in oil before passing into the kegs for shipment.

Bent track and other bolts are straightened by the air hammer, rethreaded, tumbled, oiled and kegged for shipment. Bolts with damaged threads are cut to standard lengths before treatment.

During 1917 more than 1,400 Weber joints were reclaimed. As these are received in scrap all that are not cracked or broken are reclaimed. If badly cracked the short leg of the angle is cut off by shears, leaving the long leg to be utilized as a switch plate.

The joints suitable for reclaiming are fitted with new wood filler blocks, manufactured in the company wood shop at Scranton, Pa. The bolts and steel washers used are all reclaimed, as are the fiber washers, which are stamped out of old fiber. In the reclaimed joint the wood and the fiber angle are the only new parts. The joints are all assembled at the plant and given a bath in oil before shipment to the roadway.

Standard tie plates received in scrap are all sorted and all usable plates are recovered. Plates which are slightly bent are straightened under the 350-lb. hammer. Tie plates no longer standard but suitable for side and industrial tracks are punched at a small cost to fit rails of different size. Generally four men are required for this work, one to operate the punch and three men with wheelbarrows to serve it.

RECLAMATION PRACTICE ON THE PENNSYLVANIA

The reclamation of track materials on the Pennsylvania is carried on under what may be termed a divisional system rather than in a central plant. In general, the plan is to provide a large plant on each grand division to which the track scrap, including rails, frogs, switches, switch stands, switch plates, switch rods, tie plates, splice bars, anti-creepers, angle bars, track bolts, track spikes, etc., may be shipped. At these plants the scrap is carefully sorted and large quantities of various kinds of materials suitable for reuse without treatment are recovered and transferred to the stores department, where they are subject to requisition. Materials, which, with treatment, can be made fit for further service are also recovered during the sorting while all of the scrap still remaining is held for sale.

The reclamation at the large plants is supplemented to a considerable extent by the reclaiming accomplished locally or on the supervisor's sub-divisions where worn frogs and switches are restored to their original shape and cracked angle bars are repaired by the oxy-acetylene process in small shops provided for the purpose. The largest of the grand divisional plants is located at Trafford, near Pittsburgh, Pa., and the work done there is typical of what is being done at other points.

THE TRAFFORD PLANT

The Trafford plant has been in operation for approximately a year. At present the outside equipment consists of two air cranes and a locomotive crane. Eventually a magnet will be provided for handling the scrap.

The shop is located about midway in the storage yard and a standard gage track extends through the shop and into both ends of the yard. This track is utilized for transporting to and from the shop and yard any material needing treatment, standard gage trucks being used for this purpose. The inside shop equipment includes oxy-acetylene outfits and the furnaces necessary for this work.

Battered and broken rails received at the plant are reclaimed for further use in track, provided a length of not less than 20 ft. can be salvaged. Short length rails are utilized for guard rails, being bent to the proper shape after a V-shaped section is cut out of the web of the rail by the torch. At present a rail bender is used for this purpose, but eventually it will be done by air. The end-cutting and reboring of rails is done by oxy-acetylene. A hole is bored in about 35 seconds and a rail is cut in about 1½ minutes.

Worn frogs and switch points are made fit for further service by the application of metal to the worn parts, thus building them up to their original shape. In case the wear of switch points is too great for the building-up process they are cut into unequal lengths. The time and cost for restoring a frog, of course, varies with its condition, but on the average the time required is from six to ten hours and the cost runs from $9 up. The cost of building up switch points runs from $3 up and three points can on an average be repaired or made over by one man in a ten-hour day.

Cracked splice bars are restored to serviceable condition by cutting away the material around the crack with a cutting torch, after which they pass to a welder, who builds up the bar with alloy to the original shape. The metal around the crack is cut away in a V-shaped section to facilitate the welding. On an average one-half hour is required to repair one crack.

Tie Plates Awaiting Treatment

Large quantities of smaller track materials, including tie plates, anti-creepers, track bolts, track spikes, etc., are received in the scrap, which are fit for further service without special treatment. These are recovered during the sorting and held in the storehouse subject to requisition. Tie plates which are bent are straightened under a belt-driven hammer, as are the bent spikes which are not seriously damaged by throat cutting. A special die, fashioned so as to maintain the original contour of the spikes, will be added to the shop equipment eventually. Spikes are straightened at the rate of about 20 spikes per minute.

Track bolts are reclaimed by rethreading with a cut thread of the same standard size as the original rolled thread and new nuts are furnished. Experiments are being carried on to determine the practicability of rethreading bolts, running down 130-lb. bolts to 100-lb. size and 100-lb. bolts to 85-lb.

REFORMING SPLICE BARS

At the Juniata shops near Altoona, Pa., the Pennsylvania heat treats worn splice bars. The treatment is purely a reclamation process by which splices no longer serviceable because of wear at the bearing points are restored to standard heights.

All splice bars selected for reforming are carefully inspected and all that show cracks are rejected before

loading. Those fit for treatment are then shipped into the shop and unloaded in piles convenient to it. From the storage piles they pass into the drop forge furnaces where they are subjected to heat. They then are placed in the proper die and struck once or twice with a steam hammer and shaped so as to conform to the standard height. This process makes the splice a trifle thinner than the standard section.

They then pass to the heat-treating department and into furnaces of the "car bottom" type, which are a part of the regular shop equipment. A charge is approximately 100 splice bars, which are placed on the car and run into the furnace. At the beginning of the treatment the temperature in the furnace is never more than 400 deg. and the heat is advanced at a rate of 200 deg. F. per hour until a temperature of 1,500 deg. F. is reached, which is maintained for two hours. To reach this temperature about five hours are required, making a total of seven hours' time for this part of the treatment. As the temperature is raised it is recorded by a Thwing electrical pyrometer. The observer at the pyrometer keeps the men at the furnace advised by means of electric light signals whether the temperature is advancing at the proper rate. From the heat of 1,550 deg. F. the bars are quenched in water until the temperature is reduced to about 200 deg. F. This is accomplished by withdrawing the bars from the furnace into a basket which, when loaded to capacity, is carried to the quenching tank by a traveling crane.

After the quenching the bars are again loaded on to the cars and returned to the furnace, where they are "drawn back" or tempered. This process consists of advancing the heat from not more than 400 deg. F. to 1,075 deg. F., at a rate of 200 deg. per hour and maintaining the temperature of 1,075 deg. F. for three hours. This process requires about six hours.

After the heat has been maintained for the specified time, the furnace is allowed to cool slowly to 500 deg. F., when the bars may be withdrawn and placed in piles to cool. The piling insures the slow cooling which is desirable.

When cool the bars are taken to the boiler shop, where they are fitted over a die having the proper spacing for the bolt holes. If the holes have closed up during the preceding treatment a die is forced through them to make them the proper size for the track bolts.

The reforming and heat treating are done entirely by the mechanical department on a shop order from the division engineer or supervisor.

BALTIMORE & OHIO RE-THREADS BOLTS

The Baltimore & Ohio reclaims monthly approximately 60,000 lb. of track bolts, nuts, washers and spikes at its Glenwood scrap dock at Pittsburgh, Pa. This material is recovered from the general run of scrap as it is received at the plant. In sorting the scrap into the different grades all drive spikes except those badly throat cut are reclaimed. Quantities of these are fit for use without treatment, which at present is confined to straightening those which are bent.

The bolts which are recovered from the scrap are of two sizes: ⅞-in. and 1-in. bolts, the smaller sizes being obsolete and generally badly worn. In sorting out those fit for treatment, bolts with more than one thread destroyed at the end are rejected as unfit. Farther up on the bolt more latitude is allowed and when the damage does not extend more than one thread into the nut the bolt is recovered.

Approximately 20 per cent of all track bolts received at the plant are reclaimed. The treatment consists of straightening and if necessary the recutting of threads by means of special dies conforming to the Harvey grip thread. In most cases second hand nuts are used with the reclaimed bolts and before delivery of the reclaimed product to the roadway the nuts are tried on the bolts by hand. If they advance more than two or three threads the old nuts are discarded and new ones applied.

The treatment of the second hand nuts is confined to subjecting them to an oil or asphaltum mixture bath. The reclaimed bolts, nuts and spikes are restricted in use to yard and industrial tracks. In this service uniformly satisfactory results have resulted.

The equipment in the bolt shop includes a No. 4, 100-lb. Beaudry electrically-operated spring hammer, under which the bent bolts and spikes are straightened, an Acme triplehead 1½-in. bolt threader equipped with special dies conforming to the Harvey standard grip thread. These threads are beveled to produce a gripping of the nut as it is turned on the bolt.

The cost of reclamation runs about two cents per lb. The profits from this work with the present high prices for new materials are important and with the present output and high prices will exceed $1,200 per month.

CHICAGO, ROCK ISLAND & PACIFIC PRACTICES

As on many roads, the Chicago, Rock Island & Pacific is placing special emphasis on the reclamation of scrap at the source as far as this is practicable. To this end standard boxes are provided at each section headquarters for the collection of material. The local forces are encouraged to sort over the materials collected in this way and to reuse as much of them locally as possible. Those which cannot be utilized in this way are sent to the system reclamation plant at Silvis, Ill., where they are sorted and classified.

As far as track bolts and spikes are concerned, reclamation is confined to sorting and kegging. These materials are picked out of the scrap as it is moved over the dock. The threads of all bolts are tested, nuts are turned on

A Scrap Dock Is Installed at Each Tool House

loosely and they are then oiled and placed in kegs for further use. All bolts with defective threads are scrapped at once. Many rail anchors, nut locks, guard rail clamps and tie plates are also sorted out in this way for further use. In 1918 there were reclaimed and returned to service 212,802 lb. of tie plates, 73,240 lb. of rail anchors, 7,590 lb. of angle bars, 33,406 lb. of track spikes, 3,200 lb. of track bolts and 33,406 nut locks.

One detail to which special attention has been given has been the repair of high speed bits for track drills. This is accomplished by welding a soft steel body on a small piece of scrap high speed steel as a head. Because of this it was not necessary to purchase any high speed steel for this purpose during the war period, a time when it was both costly and difficulty to secure. By charg-

ing scrap prices for the steel used, bits were secured at a cost of from $.89 to $1.06 for both labor and materials as compared with quotations during the shortage in 1916 of $3.49 for 15-16 in. to $3.75 for 1 1-16 in. bits. It is estimated that from $5,000 to $6,000 was saved annually by this practice.

THE SANTA FE PRACTICE AT CORWITH, ILL.

The Atchison, Topeka & Santa Fe has a scrap sorting and reclamation plant at Corwith (Chicago), Ill., where scrap from all departments of the railroad is handled collectively. The reclamation of track materials is not carried to the extent that it is on some other roads, but large quantities of maintenance of way wrought scrap is reclaimed by rerolling it with material from other departments to produce wrought bars used very largely in car construction. Considerable attention also is given to the reclamation of track spikes and track bolts, nuts and nut locks, while angle bars are all carefully separated from other scrap and all the steel bars are sold as such, thereby

The Santa Fe Scrap Yard at Corwith

A Pile of No. 2 Railroad Wrought Scrap
Typical Pile of Scrap as Unloaded

Scrap Tie Plates Arranged in Piles
Bundles of Wrought Iron Scrap Ready for Rerolling

obtaining the regular price established in the scrap market for that material.

The scrap is received in the cars unsorted, except as maintenance of way scrap is ordinarily delivered separate from mechanical scrap. This material is unloaded from the cars by a locomotive crane equipped with an electro magnet. The material in the piles thus unloaded is sorted by hand. The old angle bars and other rail joints are separated and arranged in piles according to sizes and types. The old wrought iron bars are kept separate and saved for rerolling, while the steel bars are sold as scrap of that class. Bolts, spikes, nuts and nut locks are thrown into a separate pile to be sold as No. 2 wrought scrap, but this material is picked over by hand and all spikes, bolts, nuts and nut locks considered worth reusing are removed. In collecting bolts, only such are taken as are straight and have a good thread. In the case of spikes all throat cut or badly-corroded spikes are discarded, but bent spikes are taken if otherwise in good condition. The bolts, nuts and nut locks are sorted and fitted up, oiled and placed in bins according to size and style. The spikes are placed in a rattler to remove scale and rust, each charge being given a four-hour treatment. They are then straightened by hand under a trip hammer.

Tie plates are also sorted, and if any of the types in standard use are found to be in condition for reuse they are held out and placed in stock. Where tie plates are still in a usable condition but are obsolete in that they were made to fit a weight of rail no longer in use, the holes on one side of the plate are slotted out to fit a rail of slightly wider base than that for which they were originally intended. Such tie plates are then sent out for side track use.

As mentioned above, one of the important activities of this reclamation plant is the rerolling of wrought iron scrap. For this purpose all scrap of a suitable length is cut up, packed in bundles and securely wrapped with wire or flat hoop iron. These bundles are placed in heating furnaces until the desired temperature is obtained and are then passed through suitable rolls to obtain the desired sizes of flat and round bars. In 1917, 9,231,000 lb. of material was rerolled in this manner, of which 10 per cent was angle bars. In 1918 about 1,500,000 lb .of material was rerolled per month. The bars are rounds, varying from $\frac{5}{8}$ in. to $1\frac{1}{2}$ in. in diameter and flats varying from $\frac{1}{4}$ in. by 1 in. to 1 in. by 4 in. This material is all used in the manufacture of bolts and forgings used in car repairs.

The reclamation of track fastenings in 1917 amounted to 1,308 kegs of bolts and spikes. In any case where a quantity of material as large as this is being reclaimed it is important to provide the necessary means of having it used. For this purpose a catalogue of second-hand material is issued at the end of each month in which all reclaimed material in stock at that time is listed. Some

400 or 500 copies of this report are sent out, so that every roadmaster, master mechanic and superintendent receives one. These officers are expected to watch this closely and do not usually order any new material when material of the kind required is available on this second-hand list.

RECLAMATION ON BURLINGTON CONFINED TO SORTING

In general, the western roads have done less than those in the east in the reclamation of track fastenings other than by sorting, although the latter practice is probably followed more universally on the lines west of Chicago than east. This is in contrast with the practices followed in the reclamation of rails where the most complete equipment for improving their service life is found on western roads.

Among the western railways the Chicago, Burlington & Quincy probably devotes as much attention to the reclamation of track fastenings as any line in that area. Its reclamation starts with the treatment of its smaller fastenings, particularly bolts and spikes, with oil on their receipt from the manufacturer and before they are shipped out for use or placed in stock. To accomplish this an arrangement has been devised at Galesburg, Ill., by means of which they are immersed in oil in their original kegs. A series of 10 frames has been erected, each holding a keg of bolts or spikes in a horizontal position. Each frame is counterweighted to balance a keg. Below these frames is a steel-lined tank filled with oil into which the kegs are lowered and immersed until they are filled with oil, as indicated by the air bubbles ceasing to rise to the surface, usually about 30 sec. The kegs are then raised and placed on an adjacent slatted platform for 24 to 48 hr. to permit the excess oil to drain back into the tank. The kegs are inspected before being placed in the frames and those too tight to permit ready entrance of the

Bolt Oiling Racks

oil have small holes punched in them. One man is required to operate each two frames. About 1-5 gal. of oil is required per keg. An inspection of bolts treated in this manner before going into stock showed them entirely free from corrosion and the oil still coating them thoroughly after over one year's storage.

After coming out of the track, the bolts and spikes are sent with the miscellaneous scrap to a central receiving and sorting yard at Aurora, Ill., where they are sorted over and those fit for further service picked out. These materials are subjected to three sortings before leaving the yard as scrap for sale. A first inspection and sorting is made as the scrap is unloaded from the cars, that considered fit for further service being thrown into kegs for working over or classification. The materials are then sent to bins where they are again sorted over. A third and final sorting is made as the cars are loaded with scrap for sale. Bolts recovered in this manner are sorted as to sizes, matched up with nuts, oiled, kegged and sent to the store department for use. No reclamation work is done on bolts, nor are any used which are in any way defective. Spikes sorted out are sent to air hammers for straightening and after being straightened are classified as No. 1 (good as new, for use in yard and side tracks) and No. 2 (for use on unimportant industry tracks). No second hand material is used in main tracks,

The Scrap Receives Its First Sorting as It Is Unloaded from the Cars

as enough cannot be secured for secondary track requirements.

For the first five months of 1918, 1,555 kegs of spikes, 117 kegs of track bolts and 23 kegs of nut locks were recovered in this manner at Aurora. The average annual recovery of spikes alone at this point, which receives the scrap from the lines east of the Missouri river alone, is between 4,000 and 5,000 kegs. This is exclusive of the materials released in rail-relaying operations which are shipped separately and not as scrap. The cost of reclaiming spikes, including sorting, straightening and rekegging, is about 30 cents per 100 lb. or 60 cents per keg. All of this work is done by piece work.

All tie plates released from track are shipped to Galesburg, Ill., where they are sorted into three groups, (1) those usable in their present condition, (2) those usable if straightened and (3) scrap. The usable plates are further divided into two groups.

NORFOLK & WESTERN REBUILDS JOINTS

The Norfolk & Western also reclaims joints and returns them to service.

Both Bonzano joints and angle bars that are worn and bent are straightened in the blacksmith shop. The bars are heated in an oil furnace, placed in a die, and swedged with a drop hammer. They are swelled to their original section by placing a piece of steel 1⅞ in. wide by ⅛ in. thick and about 3 in. long in the center of the bar. This does no damage to the bar, except that it leaves a slight depression at that point, and in some cases disfigures the two middle holes, which it has been found advisable to reshape by hot punching. The average labor cost of swedging these bars is about 5 cents a joint. The handling of the bars to and from the cars, interest on the investment, etc., will run this up to about 15 cents a joint. These reclaimed joints are fairly smooth and are used on branch line main tracks in many cases with resawed rail, where a very heavy slow freight movement but no fast passenger movement is handled.

UNCLE SAM'S VENTURE IN RAILWAY CONSTRUCTION

The government is building a line across glaciers, through canyons and on mountain slopes to reach the interior of Alaska, land of the midnight sun.

Activities of the Railroad Administration

Government Fears That Roads Are Being Over-Maintained

Directer-General Hines Appeals to Employees for Co-operation

Washington, D. C.

DIRECTOR GENERAL HINES has sprung somewhat of a surprise on the railroad corporation executives and the engineering and operating officers, many of whom have been expressing concern that their roads were not being properly maintained, by taking the position that the Railroad Administration is up to its contract obligations in respect of maintenance and issuing orders intended to avoid the danger of the government spending more for maintenance than is required by its contract to return the properties "in substantially as good repair and substantially as complete equipment" as they were when taken over on January 1, 1918. For the month of June he issued instructions to the regional directors on May 27 that the maintenance of way ratio of each road to total operating revenues shall not exceed its average yearly ratio of the test period. The regional directors were given authority to make emergency exceptions when deemed absolutely necessary under special or unusual conditions, and various modifications of the general instructions were subsequently issued to prevent the discontinuance of necessary work, but the effect was to impose a check, pending the issuance of more definite instructions as to the balance of the year which are now being worked out by the Division of Operation and are expected to be issued soon.

The principles which are to govern the maintenance of way and structures program for the rest of the period of federal control have been the subject of conferences for several days. On June 20 and 21 the engineering assistants of the regional directors were in Washington working on the problem with A. M. Burt and W. J. Cunningham, assistant directors of the Division of Operation, and their recommendations were to be submitted to W. T. Tyler, director of operation and the director general.

Various instructions that have been issued by the Railroad Administration for the preparation of data analyzing the maintenance during the test period and that during federal control and for the establishment of the program for 1919 have been recounted in previous issues of the *Railway Maintenance Engineer* and more or less tentative budgets have been prepared in each region which have served as a practical working basis, but these have been founded mainly on the idea of matching the average maintenance for 1918 and 1919 with the average for the test period and the Railroad Administration has now come to the conclusion that this standard is not always an equitable or practical one and in some cases would represent a greater expenditure than would be required to put or keep the property in the condition of January 1, 1918, which is the primary obligation of the government.

The contracts between the railroads and the government provide as the standard of upkeep the expenditure or payment into funds of such sums as may be requisite in order that the property "may be returned to the company in substantialily as good repair and in substantially as complete equipment as it was on January 1, 1918," and there is a proviso that the annual expenditure and charges for such purposes during the period of federal control of an amount equal to the average annual expenditure and charges during the test period, with some adjustments and allowances for differences in the cost of labor and materials, shall be taken as a full compliance with the foregoing covenant.

The contract also provides that excess maintenance requisite for the same operation of the property shall be made good by the company by deduction from its rental, but the power to make such deductions and consequently the ability of the Railroad Administration to collect for any surplus of maintenance, is practically very much limited.

The attitude assumed by the Railroad Administration now is that in general roads have not been under-maintained as to maintenance of way and structures as compared with the condition in which they were taken over, and that in many cases they have been over-maintained, and that, moreover, any deferred maintenance of way has been offset by excess maintenance of equipment. This was brought out definitely by Director-General Hines in a statement on June 4 before the House appropriations committee, in reply to a question from the chairman of the committee regarding the claim that the maintenance has not been kept up to standard and that there will be a considerable loss to the government in order to make good deferred maintenance. Mr. Hines said that undoubtedly as to locomotives the condition is far better than it was when the government took over the railroads, because, generally speaking, they were not in good condition on January 1, 1918, and they are in very good condition now. He would not undertake to say that the condition of the roadway and structures was in all respects on January 1, 1919, as it was on January 1, 1918. He thought in many respects it was a good deal better, but in some respects it might not have been as good, because probably less rail and cross ties were put into the property last year than usually and there was some shortage of labor. But, he said, taking the roadway and structures and equipment together, the average condition of the property as a whole is as well off as it was on January 1, 1919. He said the favorable weather had made it possible to make up for work not done last year, that a good deal of rail that was not put in last year has already been put in this year, and that as of April 30, the Railroad Administration could claim that the roadway and structures by themselves were in as good condition as on January 1, 1918, in addition to the balance in its favor on the equipment. "My best judgment of the situation as a whole is that at the present time we are fully up to our contract obligations in respect of maintenance of roadway and structures and equipment; that taking the whole thing, together for all the roads together, we are fully up to our contract required," he said.

Mr. Hines thought the railroad companies had fallen

into two or three errors. They assume, he said, that the standard contract obligates the government to put into the property each year of federal control on an average, the quantities of material and labor that were put into the property on an average per year during the test period. That is not the case, he declared. The obligation is to turn the property back in substantially as good condition and it will be practicable on many railroads to do that without expending as large quantities of labor and material as were expended during the test period on an average and where it is practicable the government does not have to put in a larger amount. The provision that the same quantities of labor and material may be used is not an obligation, but is an option which the government may take if it is more favorable than the other standard. Again, he said, the companies have attached great importance to the fact that the shortage of rail and ties proved a deterioration in the property as a whole. He thought that was not true, because it was frequently made up in other ways. He mentioned that many railroads in the test period were building up their property and that a similar expenditure is not necessary to keep up to the condition established, while generally the railroads did not keep up their property in the last six months of 1917 as well as they did during the test period, so that less maintenance than that of the test period is necessary.

"It has been the tradition of the subordinate official," Mr. Hines said, "as against his own superior officer or as against anyone else, that he wanted to maintain his property just as well as he could, and if he could maintain his property better than the corporation wanted it maintained he would do it, because he just naturally wants his property in the best condition he can have it, and I take it that the subordinate officials will be just as anxious to do that under federal control as they were under private control and that they will spend all the money on maintenance that they can get to spend.

"Now, since the interest of the government is very distinct from the interest of the corporation and since the government interest is to see that he does not spend any more than the contract requires, it becomes necessary to look with special care on the perfectly natural tendency of all subordinate railroad officials to build up their property; but they would not do it out of disloyalty to the government. It is out of loyalty to the property they are holding, and they build the property up regardless of the policy of their own corporation, if they can get the money to do it. I do not regard that as any reflection, but I do mean it is a matter that the government must look after very closely in order to see that the property is not overmaintained through the enthusiasm of the subordinate officials to have the best property they can have."

With the close of the accounts only a little over six months away the Railroad Administration is preparing to devote special attention to maintenance expenditures with a view to coming out as nearly even as possible. W. J. Cunningham, heretofore manager of the Operating Statistics Section, was appointed assistant director of the Division of Operation on June 1, and he was also appointed chairman of a special committee on maintenance expenditures, including A. M. Burt, who was appointed assistant director in charge of engineering and maintenance of way, succeeding G. A. Morse, resigned, and Frank McManamy, assistant director in charge of mechanical matters. The object is to co-ordinate the work of the two departments in relation to the contract obligation.

The maintenance of way expenditures of the large roads and terminal companies for the first four months of this year were $235,405,000, as compared with $170,943,000 in the first four months of 1918. They consumed 15.5 per cent of the operating revenues, as compared with 13.3 per cent for the entire year 1918 and 12 per cent for the test period. However, expenses of all kinds have been going up faster than revenues, and as compared with total operating expenses the maintenance expenses show a less variation. In the first four months of 1919 maintenance of way represented 17 per cent of the operating expenses and in 1918 it represented 16 per cent of the expenses, while in the test period the ratio was 17 per cent, or the same as during the first part of this year.

DIVISION OF ACCOUNTING COLLECTS MAINTENANCE DATA

The Division of Accounting of the Railroad Administration has just issued its Circular No. 101 calling for the information required for the purpose of ascertaining facts incident to the maintenance, repair, renewal, retirement and depreciation of roadway and structures and the expenditures and charges therefor required to meet the provisions of section 5, relating to upkeep, of the standard agreement between the director general and the railroad companies and for the purpose of recording upon the operating books of the federal administration the necessary accounting data in connection with upkeep. The federal auditors are directed to take immediate steps to prepare, record and report the data called for on six forms included in the circular, which has been in course of preparation for several months. It takes the place of Circular No. 28 issued by the Division of Operation in March, which was suspended because it involved such a burden of clerical work on the roads and the furnishing of the information then called for would involve a duplication of the work which was to be called for by the accounting department. The circular issued by the Division of Operation was expected not only to provide the data necessary to ascertain whether the contract obligation as to upkeep was being complied with, but also to set the maintenance program for 1919. The latter question, however, has become involved in complications and has required further instructions.

A considerable portion of the data required by the accounting circular has been or will be reported to the Interstate Commerce Commission, and will form the basis so far as applicable of the returns required by the circular. Five copies of each report are to be made, one for the director of accounting, one for the director of operation, two to be sent to the regional director, one of which is to be sent by him to the proper officer of the corporation, and one for the federal manager. Federal auditors are also directed to discontinue the use of all maintenance of way and structures operating reserve accounts which may have been created by charges to operating expenses subsequent to December 31, 1917. Reserves of this kind arising out of charges prior to January 1, 1918, are not authorized and must not be shown on federal books.

Form 1 of the reports required is an analysis of maintenance of way and structures expenses designed to show the comparison between the test and federal control periods.

Form 2 is a comparison of labor costs for the two periods for the purpose of obtaining the factors for equating the cost of labor.

Form 3 is for the comparative cost of selected items of maintenance materials designed for the purpose of obtaining the factors for equating the net material charges.

Form 4, a comparison of maintenance of way and structures expenses, is designed to show the total expenses for each year and for the entire test period, the average for such period, the equated average expenses for the test period, the total expenses, for one year of federal

control and the increase or decrease in maintenance expenses for the year as compared with equated average expenses for the test period.

Form 5 covers maintenance of way and structures expenses on account of fire damage, maintenance of additional property taken over, and improvements during federal control and a final summary designed to show by comparison of costs, in case the property has been improved through maintenance, the increase in maintenance expenses, and in case the property has not been maintained to standard, the decrease in maintenance expenses.

Form 6, operating statistics, is to secure data which may indicate the comparative use of the railroad during the test and federal control periods.

UNIFORM RULES AND WORKING CONDITIONS

It is understood that the work on the proposed uniform rules and working conditions for maintenance of way employees is well advanced and that they will soon be announced by the director general for application on all roads under federal control, superseding all previous agreements on this subject. Proposed rules and working conditions were recommended to the Board of Wages and Working Conditions by committees consisting of one representative of each regional director and an equal number of representatives of the employees and the director general's announcement will be based on the recommendations of the board.

RAILROAD APPROPRIATION REDUCED

The House committee on Appropriations reduced the appropriation of $1,200,000,000 asked for by Director General Hines to meet present and expected obligations of the Railroad Administration to $750,000,000, and it was so passed on June 10. In making this reduction the committee stated that this appropriation would make suitable provision for the needs of the present and immediate future, while the estimates for the far future are so indefinite and uncertain that further appropriations should be deferred until the needs could be determined.

The Railroad Administration has issued complete figures covering the operation of the railroads for the month of April, which show operating revenues of $384,739,685, an increase of 5.3 per cent and expenses of $339,229,299, an increase of 22.7 per cent, resulting in a decrease in net operating revenues of $43,583,039. The net loss to the government for the month was approximately $58,000,000, being the total deficit for the first four months of the year to nearly $250,000,000.

As announced in the last issue, the Railroad Administration placed orders for 200,000 tons of rails late in May for delivery before August 1. This is the first order for rails placed by the Railroad Administration since the roads were taken over on January 1, 1918, the renewals up to the present time being made from deliveries on orders placed prior to government control. The average rail renewals during the three-year test period aggregated 1,350,000 tons a year and this is the tonnage which the Railroad Administration is obligated to renew each year. Only about 1,100,000 tons of rails were relaid last year, so that there was a shortage of approximately 250,000 tons, making the total requirements for this year approximately 1,600,000 tons. There was still outstanding on unfilled orders on January 1, 1919, approximately 1,100,000 tons. With the recent order for 200,000 tons it is apparent that an order for 300,000 tons will provide the rails necessary to enable the government to meet the test period standard and take up the deficiency of last year. It is also necessary to provide about 90,000 tons in order that the quantity carried over for 1920 may equal that on hand on January 1, 1918.

The Railroad Administration has collected statistics showing the number of cross ties renewed on the roads under Federal control during the three years of the test period, during the ten fiscal years from 1908 to 1917, inclusive, and during the calendar year 1918. Based on this data it has also prepared an estimate of the renewals for the present calendar year. As shown in the table, the renewals during the last year averaged 214 per mile of all tracks (259,825 miles main track and 363,728 miles of all tracks), as compared with an average of 261 for the test period, a decrease of 18 per cent, while the program for this year contemplates the renewal of 282 ties per mile or 8 per cent above the test period standard.

STATISTICS OF TIE RENEWALS ON ROADS UNDER FEDERAL CONTROL

Region	Test period: Years ended June, 1915	June, 1916	June, 1917	Average test period	Average ten fiscal years 1908-1917	Calendar year 1918	Estimate Calendar year 1919	Average ties per mile—all tracks: Test period	Ten years	Calendar year 1918	Estimate year 1919
Eastern	21,418,229	15,437,157	14,477,924	17,046,906	17,439,624	14,490,867	18,968,941	248	254	211	276
Allegheny	12,365,703	11,203,789	10,250,718	11,279,377	10,356,666	7,619,407	12,259,789	256	237	173	278
Pocahontas	3,467,486	3,629,486	3,175,235	3,432,515	2,532,878	2,575,800	3,129,640	387	287	289	352
Southern	18,436,374	18,710,978	16,166,189	17,782,366	16,879,416	14,495,516	20,951,893	321	315	262	378
Southwestern	12,905,094	14,530,062	10,936,410	12,765,499	13,089,762	9,634,298	11,626,191	293	309	221	267
Central Western	17,518,794	18,044,571	15,011,501	16,850,922	17,201,663	15,812,793	17,930,719	235	243	220	251
Northwestern	15,820,199	16,655,411	14,592,271	15,657,858	14,793,386	13,048,624	17,231,525	220	208	183	243
Total, all regions	101,931,879	98,211,454	84,610,248	94,835,443	92,293,395	77,677,305	102,098,698	261	258	214	282

Total "Average Test Period" includes eighty-four small roads with 6,847 miles and 1,625,896 ties, which roads do not enter total "Average Ten Years" because of incomplete reports.

DIRECTOR GENERAL EXPLAINS INCREASE IN EMPLOYEES

In an address before the Philadelphia Chamber of Commerce on June 20 Director General Hines asserted that the increase of 140,000 in the number of railroad employees from December, 1917, to January, 1919, was due to the establishment of the eight-hour day and to the exceptional amount of work on maintenance of way and structures in January and not to "any greater laxity on the part of railroad officials under federal control than was exhibited by those same officials under private control."

"Various public movements have been made upon the fact that there were about 140,000 more railroad employees in January, 1919, than in December, 1917," Mr. Hines said. "There has been at times a disposition to assume that this fact indicates that under federal control there has been a laxity of supervision on the part of the railroad officials throughout the country as compared with the sort of supervision which would characterize those same officials under private control. It is wholly unjust to attribute to these railroad officials any such failure in their duty to the government because the facts show that this increase in employees was due to entirely different and perfectly justifiable causes.

"In December, 1917, many employees worked on the basis of ten hours per day or longer, but during federal control and before January, 1919, the eight-hour day was put into effect for railroad employees. The adoption of the eight-hour day, therefore, made it necessary either to work many classes of employees overtime (and frequently at punitive rates of overtime), or to obtain more

employees to perform the same number of hours of labor. Overtime is undesirable and costly and hence the proper policy is to obtain enough employees to avoid working overtime except in emergencies. The principal cause, therefore, for the increase in the number of employees has been the adoption of the eight-hour day. This radical change for the protection of railroad labor makes it necessary to consider the number of hours worked instead of the number of employees worked. While in January, 1919, the number of employees increased 8½ per cent over the number of employees in December, 1917, the hours worked by employees in January, 1919, increased only 1½ per cent over the hours worked by employees in December, 1917. Thus the increase in the number of employees simply illustrates the carrying out of the policy, which I believe is generally endorsed as proper, that employees ought not to be required normally to work more than eight hours per day. The small increase in the number of hours worked reduced the disparity between December, 1917, and Januarq, 1919, to very small proportions.

"This entire increase in the hours of work in January, 1919, as compared with December, 1917, can be accounted for by the increase in mantenance work on roadway and istructures. January, 1919, was an unusually favorable month for such maintenance work because of the exceptionally good weather and the availability of adequate forces. In December, 1917, severe winter weather began at an unusually early date and labor for maintenance work was exceedingly scarce because of war conditions and especially because the railroad companies were not paying wages adequate to attract maintenance labor. The result was that in January, 1919, an exceptional amount of maintenance of roadway and structures was performed, the expenditure, therefore, being 245 per cent of the expenditure for the same purpose in December, 1917. That the entire increase in hours worked on the raliroads in January, 1919, can be accounted for in the principal classes of employees in maintenance of way and structures (foremen, section foremen, masons and bricklayers, structural ironworkers and section men), is shown by the fact that the increase in hours worked by these classes of railroad employees in January, 1919, as compared with December, 1917, was in excess of the total increase in hours worked by all railroad employees, so there was actually a slight decrease in the hours worked by all other railroad employees. The increased hours worked in January, 1919, by these maintenance forces does not imply any laxity on the part of the railroad officials throughout the country as compared with the attitude of the same officials under private management, but merely shows that these officials were taking advantage of good weather and a good labor supply to do an unusual amount of maintenance work.

"Both of these propositions are further illustrated by the month of February, 1919. In that month, as compared with December, 1917, the number of hours of work paid for on the railroads diminished 4.3 per cent, while the total number of employees increased 8 per cent, this condition being due as already explained to the recognition of the important principle of the eight-hour day. On account of the extraordinarily favorable weather in February, 1919, the expenditures in that month for maintenance of way and structures were 251.6 per cent of such expenditures in December, 1917, and the hours paid for to the principal classes of maintenance employees increased ½ per cent, while the hours worked by all other employees decreased 5½ per cent. This situation again shows that the railroad officials in February, 1919, were simply taking advantage of good weather and good labor supply to do an increased amount of maintenance work."

DIRECTOR GENERAL APPEALS FOR CO-OPERATION

Walker D. Hines, director general of railroads, has sent the following letter to all officers and employees of railroads under federal control:

"The increased payroll cost, due to improved wages and working conditions, and the increased cost of material and supplies, are now resulting, in connection with the falling off in business, in the United States Railroad Administration incurring heavy deficits in railroad operations.

"For the first four months of this year, these deficits, after deducting the rental due the railroad company, were about $250,000,000, or at the rate of $62,500,000 per month. This critical condition makes it imperative not only that costs shall not increase, but also that every effort be made to help the government through every reasonable effort to economize and realize greater efficiency.

"These deficits, so far as they cannot be eliminated through greater economies and through increased business, will eventually have to be offset by increased transportation rates which all should endeavor to avoid.

"I ask every officer and every employee to redouble his efforts to do efficient work, to economize in the use of railroad materials, fuel and other supplies, and to use great care not to injure equipment, tools, office furniture or injure property being transported by the railroad and for which payment must be made if injury occurs, and further than this, to try to encourage others to do the same. Please remember that if you should fail in any of these respects to do what you reasonably could and ought to do you would impose unnecessary cost upon the government. This is true because it is the government which has to bear the loss if there is one or which will receive the profit if any is earned.

"Do not wait for the other fellow to begin his improvement, but begin yourself. Do not decline to help because some other fellow is not helping; turn in and help and keep on setting the other fellow a good example. You are interested in the great movement for the improvement of the condition of the individual worker. You can aid in that great movement, through efficiency and saving in reducing the cost of railroad operation, because thereby you help to keep down transportation rates, and thereby you help to keep down the cost of living. An increase in rates will give occasion for an increase in prices of what the public consumes and that will mean a new cycle of increasing still further the cost of living. It is to the interest of every man, woman and child in this country that this shall be avoided just as far as it is possible to do so.

"The government, during federal operation of the railroads, as a result of its nation-wide control, has been able to do much to promote justice to railroad employees through making proper increases in their wages and proper improvement in their working conditions. In the nature of things the result cannot be equally satisfactory to all, involving 2,000,000 employees, because it is not possible in this vast undertaking to satisfy equally every one or even every class of these employees. If any employee feels he has a ground for such dissatisfaction he ought to remember the remarkable strides that have been taken by the government in the last 12 months in the recognition of the just rights of railroad employees, and compare the situation to-day with what it was in December, 1917, before federal control began. It has been a source of satisfaction to me to aid in this great work. Will you not, in turn, do justice to the government and help sustain my work, as director general, and also justify what has been done for you, by doing all that you can reasonably do to save the government money and to increase the efficiency of your work.

OIL VERSUS STEAM ENGINES*

BY C. A. LICHTY,
Purchasing Department, C. & N. W., Chicago.

IN COMPARING internal combustion engines with steam engines for small stationary plants I have limited them here primarily to plants for railroad purposes and in sizes not to exceed 40 to 50 hp. While either coal or oil can be used as fuel for a steam engine, better results can be obtained when the oil is used in the internal combustion engine rather than in the firebox of the boiler to generate steam. The discussion which follows will then consist of a short comparative study of the efficiency and economy of the two types of engines and, secondarily, of the two kinds of fuel.

On the advent of the gasoline engine it was predicted by many that it would soon put the steam plant out of business, especially at the smaller power stations. But steam was the "old reliable" for so many years when it was the only power available that where it was once established it has not always been the policy to substitute the newer type of engine during the natural lifetime of the old plant, especially where coal and labor were cheap and where the quality of the water was good for steaming purposes. At some of the important water supply stations steam pumps have been in use ever since the road was built, some of them continuing for years after it was definitely determined that other power was more economical and equally reliable.

One of the principal reasons for getting away from the steam pumping plant, in many places, and this may also apply to other steam plants, is on account of the necessity for frequent renewals of boiler sheets and flues. In some cases boilers have to be changed out in from six months to a year, depending on the nature of the water, and necessitating the shipment of the boilers to the shop for repairs. This entails considerable annoyance and expense. The expense for the maintenance of the internal combustion engine is perhaps slightly in excess of that required for the steam engine, but it is seldom necessary to send either type to the shop unless the entire apparatus is in need of overhauling.

The old argument that the steam engine with its boiler was so much simpler in construction and easier to operate than the internal combustion engine is rapidly giving way to the economies that have resulted from the use of the latter, especially where the cheaper grades of oil are obtainable. Besides, in these days the average man has a much better knowledge of mechanics than ever before, and one need not be more of an expert to handle the modern oil engine than the ordinary automobile.

Tests for efficiency as far back as 1882 showed that the gasoline unit was an active competitor with the steam plant for small installations and about 10 years later it was generally conceded that it had gained the supremacy, but just about that time the rapid development of the multi-cylinder, small type of engine used so extensively for propelling automobiles, trucks, motorcycles, etc., created such a demand for gasoline as to give the larger sizes of internal combustion engines a temporary setback until they could be adapted to operate successfully with kerosene and the cheaper grades of fuel oils, since which time they have again made considerable progress. This temporary setback did not reduce the number of plants already in service, but rather retarded their increase in numbers and their economical operation owing to the high cost of fuel—and gasoline was the only fuel in general use at that time for this type of engines. It was not long, however, until the invention of the kerosene carburetor made it possible to operate most of the gasoline engines in service with kerosene and cheaper oils and all of the newly built engines were designed to use them exclusively, which placed the internal combustion engine on a more economical basis than ever before.

The cost of installation of the two types of plants under consideration, of like proportions, may differ but little except for plants ranging from 1 to 10 hp., where the oil equipment would be much cheaper. In fact, for plants of this size steam can scarcely be considered a competitor. In some installations of from 20 to 50 hp. the oil engine may be more expensive than the steam engine and boiler, but when the additional space for the housing of the latter and its fuel is taken into consideration, it is doubtful if the steam plant often has any advantage in cost.

There is little room for doubt but that the oil engine is much more economical in the matter of attendance. The steam boiler requires nearly an hour to get up steam and almost constant attendance thereafter for firing and all of the other necessary requirements, while the oil engine can be started in an instant, and, when properly installed and adjusted, the attention required is only nominal. It is well known that many of the smaller pumping stations are operated successfully by agents, baggagemen, sectionmen, etc., when conveniently located, in connection with their other duties, requiring but a small share of their time.

A steam plant necessitates about six times the space for the transportation and storage of coal that oil does; besides, the latter may be conveniently stored under ground, where it is entirely out of the way. For reasons just stated the labor required for the handling of coal and ashes is several times that for oil. Some roads require coal to be delivered to small power plants in considerable quantities during certain seasons of the year in order to render cars and labor available for other purposes when they are most needed. The result is that the coal is most always stored outside where it deteriorates to some extent and is liable to be stolen or may catch fire from spontaneous combustion. A leading authority from one of the prominent railroads estimates that the loss of fuel from all sources in connection with a steam plant sometimes runs as high as 40 per cent, while in the case of oil it is very slight.

The Diesel type of oil engine has reached such a stage of economical operation, together with the small amount of space required for engine and fuel, as to come into general use for boats and ships and all kinds of stationary plants of from 6 to 500 hp. They operate successfully with all of the cheaper grades of oils except those having a decided asphaltic base, and the manufacturers now claim that they will soon be able to operate on such oils.

The thermo-dynamic efficiency of the semi-Diesel and true Diesel engines range roughly from 20 to 35 per cent. The economy in fuel consumption, therefore, is large when compared with the consumption for ordinary steam engines, when it is recalled that the efficiency of the small 4-valve Corliss engine is about 6 per cent; the Corliss compound 9 per cent, and the triple-expansion engine rarely reaches 18 per cent. It is a well-known fact that the simpler types of steam pumps are the most wasteful.

We will not enter into a discussion of the relative merits of the various kinds of fuel effecting the operation of the two types of engines under consideration, as they are well known to those who have to do with the designing of such plants. The cost of the different fuels varies, of course, in the different localities, but there is scarcely any place in this country where oil cannot enter into competition with coal for the purpose outlined in this subject, while, on the other hand, in many localities, the steam plant cannot enter into competition.

*Abstracted from a paper presented at the convention of the International Railway Fuel Association in Chicago on May 21.

THE AIR COMPRESSOR IN MAINTENANCE WORK

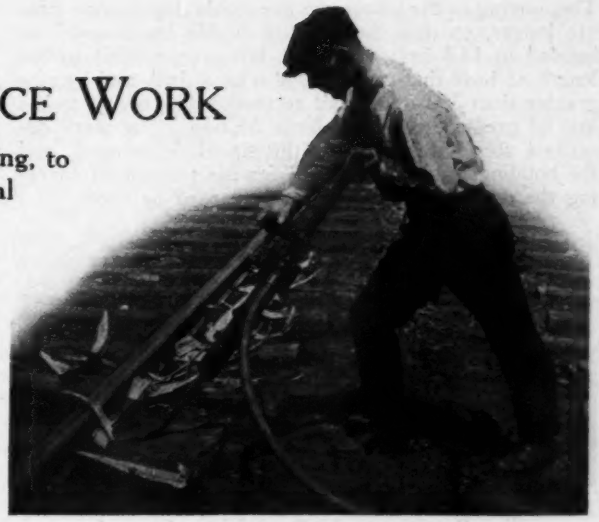
Its Application to the Drilling of Rails for Bonding, to the Adzing of Ties, Etc., Proves Economical

BY WALTER P. BURN

MANY OF THE USES to which tie-tamping outfits have been put by the railways in maintenance of way work, other than the tamping of ballast, are not well known. In view of the present labor costs and the difficulty in securing skilled workmen the varied character of work which may be performed economically with these outfits is of particular interest.

The data which is presented below has chiefly to do with the drilling of rails for bonding purposes. The information was secured from two sources: the Central of New England (a subsidiary of the New York, New Haven & Hartford), on which the bonding was done for signal circuits, and the Chicago, Milwaukee & St. Paul, where a heavier bonding was accomplished incident to the electrification of the line.

Despite the fact that the methods employed for the purpose of drilling rails pneumatically was worked out on the two systems simultaneously and entirely independently, there are several points of similarity in the two methods. The principal resemblance is in the employment of an "old man" for holding the drill up to the rail and feeding it into the hole as it drills.



Adzing Ties by Compressed Air

to do is to hook the "old man" over the rail, see that the point of the drill bit is properly placed, turn on the air, and pull back on the handle until the hole is bored. He then merely pushes the handle forward again, turns off the air, and moves to his next position.

The size of the hole drilled by the outfit here described is 9/32 in. and the holes were made through the web of a 100-lb. rail, the thickness of which is 9/16 in. An average of 70 holes per hr. per drill, or less than

Rail Bonding on the C. M. & St. P.

The Compressor Is Kept Moving Ahead of the Work

On the New Haven line a compressor car of the size known as the four-tool tie tamper car is used. The air supplied by it is sufficient to operate four pneumatic drills simultaneously, the No. 5 Little David tool being the one used. Each drill is equipped with an "old man" of the kind shown in the illustration, and is attended by one man. Another man attends to the compressor and flags the track, making, together with foreman, a crew of six. The "old man" consists of a pair of iron bars placed parallel and hooked at one end to clamp over the rail; the other end is bent downward and riveted to an angle, which is in turn fastened to a short piece of plank which rests on the ground.

The drill is supported on a pair of grooved supports which slide freely back and forth along the bars on their horizontal portion, and is fitted with a short rack in place of the usual feed screw or spade handle. The latter engages with a gear which is supported in a bearing resting on the plank and has a long handle attached to it. It will be seen from the photograph that all the operator has

one minute per hole, has been made with the outfit, which includes the time occupied in moving from one position to another. It does not take account, however, of the time consumed in moving the tie tamper car from one position to another, nor of the delay caused by passing trains. The latter is a condition which will vary greatly on different sections and on different roads, but the time consumed in changing the position of the car will be nearly uniform in every case.

With each drill equipped with 100 ft. of hose and the rails to be bonded 33 ft. in length, 28 joints may be reached from a single set-up. As each joint calls for four bond holes, and four men are each drilling at the rate of one hole per min., the total time consumed in the actual operation of drilling is 28 min. The time required to move the car 200 ft. and set up again is approximately 8 min., so that the drilling of a mile of double track requires about 15.8 hrs., not considering the time lost due to passing trains. With 225 ft. of hose attached to each drill twice as many holes can be drilled from each set-up.

The moving of the tie tamper car would require one minute longer, so that the mile of double track could be bonded in 14.3 hrs. There is, however, a limit to the length of hose that can be used with a drill, and lengths greater than 300 ft. are not recommended, owing to the loss of pressure resulting from friction. The work described above was done by the signal department, and the bonding was accomplished for the purpose of carrying the comparatively small current used by them.

Rail Bonding on the Central New England

On the Chicago, Milwaukee & St. Paul the rails were bonded to carry a current of far greater amperage. It is, moreover, a single track line and uses a lighter rail, so that the conditions represented differ considerably from the eastern road. On this work two drills were used with the air supplied by a four-tool tie tamper compressor car. Since the traffic is comparatively infrequent, the practice is to keep the compressor car moving along ahead of the drills, and two men are included in the gang to push it and attend to the compressor. The pace is obviously too slow to admit of running the car along under its own power.

The frame of the "old man" used to hold the drill up to the rail consists of two small angles held together by tie-rods, and of such a length as to brace between the rails, so that the hole is drilled from the inside instead of from outside the rail. The drill is supported on the angles in a similar manner to that used on the other apparatus, but instead of using a rack and pinion for the feed, a simple leverage is employed, the lower end of the handle, which is bent, pushing the drill ahead as the handle proper is pulled back.

Two men are employed on each drill under this system, as the whole rig is heavier, and requires two men to set it up. The gang, therefore, consists of six men, or seven if a foreman is in charge. The size of the hole drilled is ⅞ in., which is considerably larger than is necessary when the bonding is being made for the purposes of the signal department alone, requiring heavier apparatus all around. The holes are drilled through the web of an 85-lb. rail, placing four bond holes at each rail joint. The outfit averaged 1,000 rail bond holes per day and is followed up by another gang doing the actual bonding of the rails.

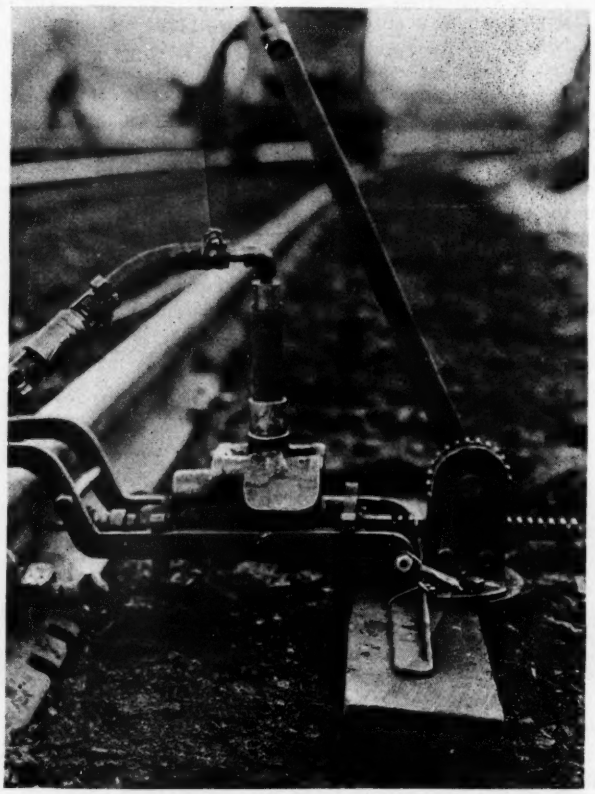
Drilling rails for electrical bonding is only one of many uses which have been devised for the portable compressor car on railroads. Jackhammers have often been used with the tie tamper compressor cars for drilling rock for blasting. Boulders are easily broken up by drilling holes in them with the jackhammer and inserting a small charge of dynamite.

In the repair and maintenance of steel bridges rivets have to be knocked out, the holes re-reamed and new rivets placed. In this operation the compressor car supplies air for the riveting hammer, the drill and the forge used to heat the rivets. One of the photographs illustrates this use of air.

Where a railway track occupies a paved city street it has been found that the tie-tamping tool, when fitted with a suitable chisel, is perfectly capable of cutting either asphalt or concrete pavement. The same tool may also be used for toothing out paving blacks, but as it is unnecessarily heavy and powerful for this task, a chipping hammer is generally used. For cutting concrete pavement, a pneumatic tool known as the concrete pick is often used, but the tie tamper may also be used for this purpose where available.

The car also finds a use when the pavement is being replaced, for air may be furnished to a sand rammer, a tool which has been found to be excellent for tamping backfill. Or in the case of having to repair leaks in a pipe line, the air is supplied to a calking hammer for calking the joints with lead wool, and used afterward for tamping the fill around the pipe.

A comparatively new use for the tie tamping tool on railways is that of adzing ties in place. For this the tool



Type of "Old Man" Employed With a No. 5 Little David Drill

is fitted with a special chisel, which is easily forged from the bar usually employed in the tie tamper. In winter the same tool has often been employed successfully for breaking out frozen coal, and has found a wide use in this application.

The modern compressor consists of a small compressor having a capacity of 88 cu. ft. piston displacement per min. at 80 lb. pressure on the large size car and 45 cu. ft. piston displacement at the same pressure on the smaller cars. The former is known generally as the four-tool car, because it was originally designed for use with four pneumatic tie tampers and the latter as the two-tool car. The compressor is driven by either a small gasoline engine or an electric motor. The gasoline-driven car is

the one generally used on steam railroads, as it is self-propelling, being capable of climbing any railroad grade up to four per cent or running on the level at the rate of 15 miles an hour. The electrically-driven car is used on some electric roads, but is designed to take its power from the trolley wire, and is not self-propelling.

All the machinery is enclosed in a steel housing mounted on the trucks, and on which the sides fold up out of the way in a manner similar to the hood of an automobile. At each end of the car is a platform designed to carry the men and equipment. The truck is four wheeled and is equipped in addition with four small auxiliary wheels running at right angles to the track. These are for the purpose of removing the car from the track, the operation of which will be described later.

To remove the car from the track it is merely necessary to place skids or lengths of rail under the auxiliary wheels and roll the car off on them to one side, an operation which can be performed by four men with ease. It is not usually necessary to remove the car from the track in a narrow cut or on a steep fill, other means of bringing the air to such points being employed, as a rule, but where it becomes necessary on a fill cribbing or posts may be placed to support the car.

Where it is inconvenient to remove the car from the track a few lengths of pipe may be joined together and the car set up at the nearest convenient point. An extra length of hose may also be carried for this purpose.

The car, when running at its full capacity, consumes about 2½ gal. of gasoline and ½ pt. of mineral oil for lubrication purposes per hour. The matter of upkeep and repairs seldom exceeds $75 for a season. The New York Central has tabulated data on some hundreds of these machines which were used in tie tamping, covering a period of five years, and has estimated that the saving afforded by their employment for that use is about $140 per mile of track tamped. This figure covers every item of cost, including the depreciation on the investment. No similar figures are as yet available on the new uses to which the machines have been put.

Cinder Fill Affects Locomotive Water Supply

BY WILLIAM M. BARR,
Consulting Chemist, Union Pacific System, Omaha, Neb.

WATER PERCOLATING through cinders dissolves large quantities of scale-forming material and increases the corrosive properties of the water. Steel pipe laid in cinder fill is soon destroyed, and even cast iron pipe under the same conditions is short-lived.

Distilled water which had been poured over cold, fresh cinders and allowed to stand for 48 hr. contained 123 grains of dissolved solids per gallon, 42 grains of this being calcium sulphate. Large quantities of other calcium compounds were present, and a natural water coming in contact with such material would have both the temporary and permanent hardness greatly increased, and this has been noted more than once.

Several cases have been reported where water percolating through cinder fill has increased the hardness of for boiler purposes because of the very hard scale that it would deposit on the flues. The writer has observed a case where water at a depth of 65 to 75 ft. has been changed by cinders at the surface, and it is interesting to note that this is the second water sheet and not the normal surface supply. The second water in this region is cut off from the first or surface water by impervious clay surface water supplies. Such water has been made unfit sheets which in places are several feet thick. Drilling a large number of test holes developed the fact that these clay sheets are lenticular, and drilling showed but four or five inches of clay in places. As this sheet appeared to be constantly thinning in one direction, it is probable that it runs out entirely, thus letting the top water down to mix with the second water, which occurs at a depth of 60 to 75 ft. The underground flow in this region is from

Character of Scale Taken from an Engine Using Water that Had Percolated Through Cinders

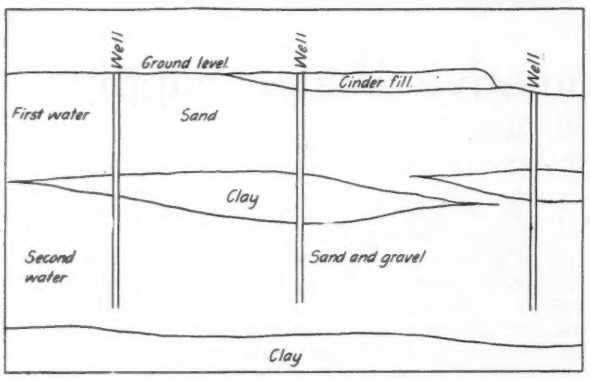
ANALYSES OF NORMAL AND CINDER-IMPREGNATED WATERS

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Silica	1.59	1.44	1.35	1.89	1.61	1.52	1.44	1.67	1.59	1.72	1.32
Oxides of iron and aluminum	.12	.27	.35	.23	...	.12	.29	5.95	1.29	.20	.56
Calcium carbonate	5.60	4.29	5.17	4.90	4.51	4.61	7.43	8.74	5.30	6.24	3.98
Magnesium carbonate	...	1.07	1.88	1.04	1.29	4.51	5.30	.54	7.42	.52	.37
Calsium sulphate	...	...	.38	...	.12	2.77	5.54	5.37	4.74	5.04	6.25
Magnesium sulphate	...	...	...	...	...	1.20	3.34	3.49	2.07	2.59	3.42
Alkali carbonates	...	.46	...	1.53	2.90	...	...	...	...	...	...
Alkali sulphates	3.61	.32	.50	.99	.62	...	...	4.87	...	1.52	1.26
Alkali chlorides	1.53	.15	.15	.05	.78	.50	.75	.75	.60	.65	.50
Alkali nitrates	....	.03	.01	.02	...	.03	.06	.15	.15	.15	.08
Total solids	12.45	8.03	9.79	10.65	10.93	15.26	24.15	31.53	23.16	18.63	17.74

Analyses shown in grains per U. S. gallon.

northwest to southeast. The conditions will be better understood from a study of the drawing.

Analyses Nos. 1, 2, 3, 4 and 5 represent the normal water of the region as it occurs below the first clay sheets. Nos. 1 and 2 are about 4,000 ft. north of the wells that show the effect of cinder fill. No. 3 is two miles west, and No. 4 is approximately 3,500 ft. east, while No. 5 is about 4,000 ft. west. There has been a considerable quantity of cinders spread in the region of No. 5, and



Probable Formation of the Clay Beds that Allowed Contamination of the Second Water

the effect is shown in the analysis of No. 6, which is from the same well. Sample No. 5 was taken in 1894 and No. 6 was taken in 1916, indicating the increase in incrusting solids which has developed during the intervening period of 22 years.

In the region most affected, there has been from 10 to 20 ft. of cinders filled into the low ground. Analysis No. 7 is a mixture of water from twelve wells in this region, and 8, 9, 10 and 11 are from four of these wells selected at random. All show heavy increases in calcium sulphate and magnesium sulphate, as well as some increase in calcium carbonate. All of the wells are approximately the same depth if due allowance is made for the surface contour.

Water from these 12 wells was used in locomotives for many years until the consumption at times reached 1,000,000 gals. per day. The use of this water resulted in heavy, hard scale on flues and fireboxes, with constant leaks in the flue sheets and much pitting. The water shown in Analysis No. 1 was then developed and pumped into the tank through 4,000 ft. of 10-in. pipe line. The result is that scale is light, leaks have stopped and there is practically no corrosion resulting from the new water. This illustrates the importance that should be attached to local ground conditions when developing new water supplies, even when the water comes from a considerable depth.

The photograph shows scale removed from switch engines operating at this station, before and after the change was made in water supply. With the improved water only a light scale like that shown on the right is formed.

THE MATERIAL MARKET

THE ONLY OCCURRENCES in the track supply market in recent weeks which have attracted any notice concern several foreign inquiries, including one for 40,000 tons of rails for Belgium, 3,500 tons of 45-lb. rails for Japan and 15,000 kegs of track spikes for China, but in each case the details have been so meager that they warrant only passing notice. In the case of American roads there has not been enough business done in railway materials to establish quotations and in the absence of better information we repeat below a table of the fixed prices on iron and steel items of interest to the maintenance of way department:

	Price in Cents Per Pound	
	Pittsburgh	Chicago
Track spikes	3.35	3.62
Track bolts	4.35	4.62
Angle bars	2.75	2.75
Tie plates, steel	2.75	2.75
Tie plates, iron	2.75	2.75
Wire nails	3.25	....
Barb wire, galvanized	4.10	....
Cast iron pipe, 6 in. or larger, per ton	....	51.80
Plates	2.65	2.92
Shapes	2.45	2.72
Bars (steel)	2.35	2.62

There has been some fluctuation from these figures in the way of clandestine shading, but these instances have not been of any particular importance and there are now some rumors of contemplated raises in the prices of wire products in the neighgborhood of $2 per ton, although the quotations remain as shown above.

The scrap market is more favorable than it has been for some time. Advances of about $1 per ton have taken place on most items of interest to the maintenance of way department except in relayer rails. Some current quotations for maintenance of way scrap are listed below:

	Pittsburgh	Chicago	St. Louis
Rail relayers		$35.00-$45.00	
Rail, rerolling	$19.00-$20.00	17.50- 18.00	$17.00-$17.50
Rail, less than 3-ft. long		17.50- 18.00	16.00- 16.50
Frog and switch cut apart		16.00- 16.50	15.00- 15.50
No. 1 Railroad Wrought	19.50- 20.00	16.50- 17.00	15.00- 15.50
Steel angle bars		17.75- 18.75	13.00- 13.50

Lumber has again advanced in all markets. Northern pine was raised $5 on all selects, $2 to $3 on dimensions, $2 on timbers and $2.50 on siding. Puget Sound prices were advanced $2 on all grades. Yellow pine has been pushed up from $2 to $5 and redwood is selling at a premium of $2.

No changes of importance have been taking place in the prices of cement during the past month. The prices have remained practically stationary, as indicated by the following table, these prices being in carload lots for cement in sacks, but not including the charge made for the sacks, which is 60 cents for cloth sacks and 25 cents for paper bags (per barrel):

Chicago	$2.00	Cleveland	$2.32
Pittsburgh	2.05	Indianapolis	2.27
Milwaukee	2.11	Duluth	2.10
St. Paul	2.30	Toledo	2.12

GENERAL NEWS DEPARTMENT

St. Paul's Cathedral, London, was filled with a congregation of about 4,000 persons at a recent memorial service when honor was shown to nearly 19,000 British railway men who had made the great sacrifice in the service of their country.

The difficulty of operating railways in Alaska is indicated by a statement in the Alaska Railroad Record of May 13 to the effect that work has just been undertaken in the opening of the line, which has been closed by snow slides for some time, sluicing being resorted to to remove a heavy snow bank lying across the track at mile 76. At another point on the line a ditcher has been working removing mud slides from the track.

The Spokane & Inland Empire, in co-operation with farmers of Spokane county, Wash., has agreed to engage men to patrol the right of way on all its lines outside of the city of Spokane in an effort to exterminate the squirrels which annually destroy great quantities of grain raised on farms adjacent to the railroad. These men will plant poison in squirrel holes on the railroad's property and poison will also be sold to the farmers, who will apply it in a similar manner on their farms.

Robert Scott, chairman of the General Safety Committee of the Atlantic Coast Line, has addressed a special letter to the clergymen in the towns along the lines of his road asking their assistance and co-operation in warning automobile drivers of the importance of the rule to stop, look and listen before crossing a railroad track. The clergymen are especially appealed to because, says Mr. Scott, "the majority of automobile owners in each community are of the best type of citizens, and it is this class which, as a rule, attend some church regularly."

The twenty-ninth annual report of the voluntary relief department of the Pennsylvania Lines West of Pittsburgh for the 18 months ending December 31, 1918, shows that the total receipts including contribution by members, contributions for operating expenses and interest totaled $1,942,551 and that the disbursements including just benefits, disablement benefits and operating expenses totaled $1,834,449, or an excess of receipts over disbursements of $88,102. During this 18 months $252,866 was paid for expenses of the relief department out of the treasury of the railroad.

During the week of June 22 to 28 an extensive campaign for the prevention of accidents of all kinds was conducted on 40 per cent of the total railway mileage of the United States. In the Central Western and Northwestern regions this week was designated "no accident week" by the respective regional directors and the campaign in each region was under the direction of the regional supervisors of safety, respectively Mr. H. A. Adams and Harry J. Bell. The campaign concerned approximately 550,000 railroad men in these two regions. A personal appeal was made to every employee in this vast district to do everything possible to equal or better the records made by employees in the "no accident campaign" in other regions.

Brigadier-General William W. Atterbury, who served as director-general of military railways of the A. E. F., has returned from France and, after a short vacation, will resume his duties as vice-president of the Pennsylvania Railroad. General Atterbury's departure from France on May 21 was the occasion of a note in "Rails and Sails," the service periodical published by army men, which said in part: "General Atterbury met the task set for him in a manner to win the highest encomiums of his own commander-in-chief and of the great leaders of the Allied Armies. He has won the esteem of his brothers-in-arms and of his subordinates. The name of Atterbury will be linked with that of Pershing as the name of Knox is linked with that of Washington and Scott with that of Grant."

Figures showing the total amount of work accomplished in the construction of the Alaskan Government Railway from the beginning of activity to April 30, 1919, were published in the Alaskan Railroad Record of May 13. On the main line 148.02 miles of track, 8.28 miles of siding, 0.92 miles of spur tracks and 8.05 miles of terminal yard tracks have been laid, while on branch lines 37.72 miles of track, 2.36 miles of siding, and 6.97 miles of spurs have been built. A total of 8,502,847 cu. yd. of material have been placed in embankment, 554,750 lin. ft. of piling have been placed in temporary and permanent structures, 3,000 cu. yd. of concrete has been deposited, 9½ miles of wagon road have been built, while 243 miles of temporary and permanent telegraph lines have been erected.

A questionnaire conducted recently by the Association of Railway Executives, New York City, showed that the general public, as estimated by nearly 6,000 editors of daily and weekly newspapers throughout the country, would vote seven to one against government ownership of railroads. The questionnaire was sent to every editor in the country (13,424) and brought replies from 44 per cent; and 83 per cent of those replying reported their communities in favor of a resumption of private management. Canvass of the replies from different states, north, south, east and west, showed that sentiment on this subject was not divided on party lines, Texas and Pennsylvania, Maine and Tennessee, showing similar percentages.

On the Pittsburgh division of the Pennsylvania Railroad, by general order, track foremen, signal foremen, and carpenter foremen are directed never to obstruct the main track so as to interfere with the safe passage of trains at full speed without first having permission from the superintendent in writing. When any such work is done flagmen must be sent in both directions. Automatic block signals, if such are in use, must be set in the stop position, and after the work is done the foreman must see that the track circuit has been restored so that the automatic signals will work properly. When permission to disturb the track is sent to a foreman by telephone he must write down the message and repeat it, as would be done in the case of a train order.

CAMP ATTENDANTS ENGAGED IN INTERSTATE COMMERCE

The Supreme Court of the United States, reversing a judgment of the Supreme Court of Idaho, holds that an employee of a railroad which was engaged in interstate commerce, injured while filling with earth a wooden trestle bridge, 1,200 ft. in length, was himself engaged in interstate commerce. The court considers the state Supreme Court fell into error in regarding the fill as new construction so unrelated to the conduct of interstate commerce over the bridge at the time the accident occurred that the work being done might be regarded as not related to or necessary to the safe conduct of that commerce.

The Supreme Court of the United States holds that an employee of an interstate railroad, injured while engaged in taking care of a camp car used by a gang of bridge carpenters who were employed by the railroad in the repair of the bridges and bridge abutments upon the line, and who cooked the meals for himself and the other members of the gang, was engaged in interstate commerce within the Federal Employer's Liability Act. The significant thing, in the court's opinion, was that the employee was employed by the railroad to assist, and was assisting, the work of the bridge carpenters by keeping their bed and board close to their place of work, thus rendering it easier for the railroad to maintain a proper organization of the bridge gang and forwarding their work by reducing the time lost in going to and from their meals and their lodging place.

PERSONAL MENTION

ENGINEERING

W. G. Tinney has been appointed division engineer of the Colorado Division of the Union Pacific with headquarters at Denver, Colo., succeeding **C. M. Thompson,** resigned.

E. G. Lane, chief engineer of the Baltimore & Ohio, Western Lines, and the Dayton & Union, with headquarters at Cincinnati, Ohio, has had his jurisdiction extended over the maintenance of way department of these roads.

E. C. Johnson, acting chief engineer of the Pacific Electric Railway Company, with office at Los Angeles, Cal., has been appointed chief engineer, vice **George E. Pillsbury,** retired, and the position of assistant chief engineer has been abolished.

Charles Kaighn, general roadmaster of the Midland Valley Railroad, with headquarters at Muskogee, Okla., has been appointed valuation engineer with the same headquarters, the jurisdiction of valuation engineer **V. V. Kirkpatrick** having been withdrawn from the Midland Valley.

C. H. N. Connell, district engineer, Quebec district, Canadian National Railways, has had his office transferred from Montreal to Quebec, Que. **T. Kearney,** assistant engineer, at Montreal, has been appointed resident engineer, Montreal division, Canadian National Railways, with office at Montreal.

Lieutenant-Colonel William G. Arn, formerly assistant engineer, maintenance of way, of the Illinois Central, with headquarters at Chicago, has returned to his former position after 22 months' service with the 13th Engineers (Railway) Regiment. Lieutenant-Colonel Arn went overseas in July, 1917, as a captain and served in the St. Mihiel and Meuse-Argonne offensives. While in France he was promoted to major and later to lieutenant-colonel, returning to this country in April, 1919. **L. H. Bond,** who has been acting as assistant engineer, maintenance of way, during Lieutenant-Colonel Arn's absence, has been assigned to other duties.

A. M. Burt, assistant general manager of the Northern Pacific, has been appointed assistant director of the Division of Operation of the United States Railroad Administration at Washington, D. C., in charge of engineering and maintenance, succeeding **Charles A. Morse,** resigned to resume his former position as chief engineer, Chicago, Rock Island & Pacific, effective on June 1. Mr. Burt was born at Syracuse, N. Y., on May 1, 1866. He began railway work as a rodman on the Colorado Midland in 1885. In 1889 he went with the Northern Pacific as an instrument man, later being appointed assistant engineer. From 1892 to 1897 he was assistant engineer on the Adirondack & St. Lawrence, the Wisconsin Central and the Chicago & North Western. On January 1, 1897, he re-entered the service of the Northern Pacific, as supervisor of bridges and buildings, and in March, 1901, was appointed assistant superintendent. From October, 1902, to January 1, 1914, he was superintendent of various divisions in Dakota, Montana and Washington. From the latter date until April 1, 1918, he was chief engineer maintenance of way, with headquarters at St. Paul, Minn.; he then was appointed acting general manager of the lines east of Paradise, Mont., and later became assistant general manager of the same road, with office at St. Paul, Minn.

A. M. Burt

C. A. Morse has resigned from the position of assistant director of the division of operation of the United States Railroad Administration in charge of maintenance and engineering, to return to his former position as chief engineer of the Chicago, Rock Island & Pacific, with headquarters at Chicago. **H. G. Clark,** who has been serving as chief engineer of the Rock Island in the absence of Mr. Morse, has been appointed assistant to the federal manager.

Louis C. Dupuis, assistant resident engineer maintenance of way, on the Canadian National Railways, has been promoted to division engineer of the Saguenay division of that road, with headquarters at Quebec, Que. Mr. Dupuis was born at L'Eslet, Que., on November 8, 1886, and attended the Laval Normal School. From January to August, 1907, he was engaged in township survey work in Manitoba, and from August, 1907, to January, 1910, was employed in Quebec on the construction of the National Transcontinental railway. Shortly after he took up provincial land surveying and river traversing in Quebec. In 1911 he was appointed assistant engineer on the Intercolonial railway, with headquarters at Moncton, N. B. The following year he was appointed assistant resident engineer on that road, with headquarters at Levis, Que., and in 1913 was promoted to resident engineer with the same headquarters. In October, 1913, he was made assistant engineer in charge of double-track work at Levis, and in January, 1916, was appointed assistant resident engineer, maintenance of way, which position he held until his recent promotion to division engineer.

Louis C. Dupuis

Casimir Stanislaus Gzowski, Jr., has been appointed special engineer to the vice-president of the Canadian National Railways, with headquarters at Toronto, Canada. He was born in Toronto on May 1, 1876, and educated at the Bishop Ridley College and the Toronto University. He entered the construction department of the Canadian Pacific in April, 1897, remaining in construction work with the Canadian Pacific and other railways until 1905. Later he engaged in railway contracting at Vancouver, B. C., and at Spokane, Wash. In 1914 he entered private practice as an engineer and was appointed on the Royal Commission of Engineering in Railways on valuation work of the railways, also serving as a special engineer for the Canadian National Railways in arbitration of value of stock, until his recent appointment as noted above.

Robert L. Schmid, assistant engineer in the chief engineer's office of the Nashville, Chattanooga & St. Louis, has been promoted to assistant division engineer on that road, with headquarters at Chattanooga, Tenn. Mr. Schmid was born at Louisville, Ky., on March 20, 1886, and entered railway service with the Louisville & Nashville in 1906 as a rodman on location work, later acting as topographer. In 1909 he became a draftsman on structural steel and reinforced concrete work on the East River division of the Pennsylvania Tunnel & Terminal Railroad project. In the meanwhile he attended the Kentucky State University at various times from 1907 to 1910. From 1910 to 1914 he was employed as instrumentman and assistant engineer on the Louisville & Nashville on location and construction work,

and from 1915 to 1919 was employed consecutively on the Nashville, Chattanooga & St. Louis as pilot engineer in the valuation department, engineer of construction, and assistant engineer in the chief engineer's office until his promotion as noted above.

B. H. Prater, engineer of buildings on the Oregon Short Line, who has been promoted to engineer maintenance of way of that road, with headquarters at Pocatello, Idaho, as announced in last month's issue, was born in Illinois on November 11, 1881, and graduated from the state university of that state in 1903. Three years later he entered railway service with the Oregon Short Line as a draftsman and engineering assistant. In 1909 he was promoted to assistant to the valuation engineer, and the following year became engineer in charge of the design of buildings and structures. In 1911 he was appointed chief draftsman in the office of the chief engineer, and from 1912 to 1915 served as engineer of buildings, including miscellaneous structures and yard and track design. In 1915 his authority in that position was extended to include the duties of office engineer and assistant to the chief engineer, which he continued to exercise until his appointment as engineer maintenance of way.

Albert M. Traugott, whose appointment as acting chief engineer of the Virginian Railroad, with headquarters at Norfolk, Va., was announced in the *Railway Maintenance Engineer* for June, was born on July 31, 1882, at Rochester, N. Y. He was educated at Purdue University and during his summer vacations worked as a chainman with the Buffalo, Rochester & Pittsburgh, and later as a rodman on the Delaware, Lackawanna & Western. In February, 1903, he entered the service of the Virginian Railroad and has served successively as rodman, draftsman, instrumentman, resident engineer on construction work and later as locating engineer on preliminary surveys. In February, 1913, he was appointed resident engineer of the Norfolk division, and one year later became division engineer of the third and Deepwater divisions, which position he held until his recent appointment as acting chief engineer, as above noted.

A. M. Trauggott

TRACK

E. O. Hightower, roadmaster on the Denver & Rio Grande at Salida, Colo., has been transferred to Walsenburg with jurisdiction over the third and fourth districts of the first division in place of F. Ivers, Jr., transferred.

Carl T. Christenson, formerly roadmaster of the Butte division of the Great Northern, with headquarters at Great Falls, Mont., who had been given leave of absence on account of military service, has returned from overseas and resumed his duties.

L. Herbert, roadmaster on the Canadian National Railways, Nemegos subdivision, Algoma district, with headquarters at Chapleau, Ont., has been transferred to White River subdivision, Algoma district, with office at Chapleau, Ont., in place of **W. B. Hall,** transferred to Heron Bay subdivision, Algoma district, with office at Schreiber, Ont., in place of **D. Wilson,** transferred.

John E. Raby, roadmaster on the Duluth, South Shore & Atlantic at Marquette, Mich., has been transferred to the Minneapolis, St. Paul & Sault Sainte Marie as roadmaster of the line between Ironton, Moose Lake and Lawler, with headquarters at Crosby, Minn. This territory is a portion of the jurisdiction of **J. Crooks,** roadmaster on the Soo Line at Superior, whose district has been divided, turning a portion of it over to Mr. Raby, as noted above.

Fred W. Sawtelle, who recently received his honorable discharge as captain in the Thirteenth Engineers of the United States Army, has returned to the Chicago, Milwaukee & St. Paul as roadmaster on the Prairie du Chien division, with headquarters at Madison, Wis., in place of **J. F. Burk,** who has been transferred to the Western Lines.

Frank Phelan has been appointed roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Aberdeen, S. D., succeeding **K. Nelson,** who has resigned. **H. Gasper,** roadmaster at North McGregor, Iowa, has been transferred to Mason City. **G. W. Wean,** roadmaster on the Illinois division, with headquarters at Elgin, exchanges places with **A. Jung,** who has been roadmaster on the Sioux City and Dakota division, with headquarters at Sioux City, Iowa.

P. C. Connelly has been appointed division roadmaster of the First division of the Denver & Rio Grande, with headquarters at Pueblo, Colo., in place of **J. Kennedy,** transferred. **O. Johnson** has been appointed roadmaster of the Second District, with headquarters at Gunnison, Colo., succeeding **A. F. Harlow,** resigned. **C. R. Schoenfield** has been appointed roadmaster of the Third District, with headquarters at Delta, Colo., succeeding **J. Gratton,** promoted to division roadmaster, with headquarters at Gunnison, Colo.

John W. Turman has been appointed roadmaster on the Kansas City Southern, with headquarters at Spiro, Okla., and jurisdiction over that road from Watts, Okla., to Heavener, including the Fort Smith branch, and also on the Poteau Valley Railroad, succeeding **George T. Anderson,** who has been promoted to general roadmaster of the Midland Valley Railroad, with jurisdiction over road, bridge and building and engineering departments, with headquarters at Muskogee, Okla., in place of **Charles Kaighn,** advanced to valuation engineer, as noted elsewhere in this issue. Mr. Turman was born in 1869 in Crawford County, Ark., and was first employed on railroad work as a track laborer on the Third District of the Kansas City Southern in 1897. In November, 1899, he was promoted to foreman and served on various sections and later with extra gangs on the Third, Second and First Divisions, respectively. He left the services of this road in February, 1903, to become extra gang foreman on the Fort Smith & Western, remaining with that railway for nine years and serving a portion of the time as yard foreman. In 1912 he re-entered the service of the Kansas City Southern and had since been in the continuous employ of that road in the capacity of extra gang foreman and yard foreman at different points until appointed roadmaster of the Third District at Spiro, Okla., effective June 1, 1919.

Charles R. Schoenfield, foreman of the Aurora yards of the Chicago, Burlington & Quincy, at Aurora, has been appointed roadmaster on the Denver & Rio Grande, with headquarters at Delta, Colo. Mr. Schoenfield was born at St. Louis, Mo., on July 29, 1893, and entered railway service in January, 1906, as a water boy for the Chicago, Burlington & Quincy at Montgomery, Ill. In 1907 he became a section laborer and the next year was promoted to timekeeper. In 1909 he was appointed assistant foreman in the Aurora, Ill., yards, and subsequently became section foreman with headquarters at Lee, Ill. In 1911 he left the Burlington and became acting roadmaster on the Chicago, Aurora & De Kalb Railway and one year later was appointed general construction foreman on the Fox & Illinois Union Railway. In 1913 he returned to the C. B. & Q. as steel gang foreman, becoming foreman of the Chicago yards in 1914. He was transferred to foreman of the Aurora yards in 1916, which position he held until his recent appointment as roadmaster on the Denver & Rio Grande.

L. J. Overman, roadmaster of the Eastern district, Kansas division, of the Union Pacific, with headquarters at Lawrence, Kan., has been promoted to general roadmaster of the Kansas division, with headquarters at Kansas City, Mo., succeeding **J. L. Gallavan,** transferred to the Colorado division, with headquarters at Denver, Colo. **R. S. Reed,** roadmaster

of the Western district of the Kansas division, has been transferred to the Eastern district, in place of Mr. Overman. **Chris Feucht,** roadmaster of the Hugo district, Colorado division, succeeds Mr. Reed as roadmaster of the Western district, and **C. C. Ramsdell** has been transferred from general roadmaster of the Colorado division to roadmaster of the Hugo district, succeeding Mr. Feucht.

J. Gratton, roadmaster on the Denver & Rio Grande, with headquarters at Delta, Colo., who has been promoted to division roadmaster on that road, with headquarters at Gunnison, Colo., as noted elsewhere in these columns, was born on June 17, 1875, in Ireland. He entered railway service with the Missouri Pacific in January, 1895, as a section laborer. From 1896 to 1897 he was foreman on that road and then entered the service of the St. Louis-Southwestern as extra gang foreman, which position he held two years. In 1899 he was employed on the Kansas City Southern in the same capacity, leaving in 1903 to become roadmaster on the Denver & Rio Grande. Later he served as roadmaster on the Kansas City Southern and from 1910 to 1914 was employed as roadmaster and superintendent of construction on the Missouri, Oklahoma & Gulf. In 1914 he again entered the service of the Missouri Pacific in the position of roadmaster, and in 1918 was appointed roadmaster on the Denver & Rio Grande, which position he held until his recent promotion.

William S. Fife, who was appointed roadmaster of the Indianapolis & Michigan City division of the Lake Erie & Western, with headquarters at Peru, Ind., as noted in last month's issue, was born at Bridgeville, Pa., on March 16, 1882, and graduated from Pennsylvania State College in 1905. In July of that year he entered railway service with the Pennsylvania Lines as a rodman and levelman in the office of the chief engineer. In 1908 he entered the service of White & Weimer, engineers, on the construction of an interurban line for the Pittsburgh Railway Company. The next year he returned to the Pennsylvania as an instrumentman on second track and grade reduction work at Knightstown, Ind., and in 1910 was on maintenance work on the Illinois division of the Chicago & Eastern Illinois. In 1912 he was appointed assistant engineer of the Texas Land & Development Company and two years later was promoted to chief engineer of that company, with headquarters at Plainview, Tex. In 1916 he again returned to the Pennsylvania Lines as engineer in charge of construction work between Frankfort, Ind., and Logansport, which position he held until his recent appointment as noted above.

PURCHASING

Horacio V. Garza has been appointed assistant purchasing agent of the National Railways of Mexico, with office at New York, vice **F. P. de Hoyos,** who was local purchasing agent. Mr. De Hoyos remains as general agent of the National Railways of Mexico as well as purchasing and general agent of the Southeastern Lines of Mexico.

Enos W. White, material agent on the Pennsylvania Railroad, has been advanced to district storekeeper at Altoona, Pa.; **Sidney I. Gowland,** foreman, has been promoted to district storekeeper at Pittsburgh, Pa.; **Harry C. Ray,** material agent, becomes district storekeeper of the Central Division; **Herman C. Reichle,** material agent, has been promoted to district storekeeper of the Northern division and **John H. McCarthy,** material agent, has been advanced to district storekeeper of the Philadelphia Terminal.

C. R. Couchman, tie and timber agent on the Pere Marquette, has been appointed assistant purchasing agent and general storekeeper in place of **N. C. Foss,** who has entered the service of the Grand Trunk Western Lines, and **W. W. Bracy,** stationer, has been appointed tie and timber agent vice Mr. Couchman, both with headquarters at Detroit, Mich.

H. P. McQuilkin, assistant general storekeeper of the Baltimore & Ohio, who was promoted to general storekeeper of the Baltimore & Ohio, the Cumberland Valley, the Western Maryland and the Cumberland & Pennsylvania, with headquarters at Baltimore, as noted last month, was born at Martinsburg, W. Va., in February, 1887. He was educated at the public schools and high school of that place, graduating from the Martinsburg high school in 1903. On April 1, 1905, he entered the employ of the Baltimore & Ohio as a distributor in the stores department at Cumberland, Md., from which position he was promoted to clerk in the motive power department at Cumberland, in August, 1906. On October 1 of that year he left the employ of the railroad to accept a position as timekeeper and paymaster with the N. & G. Taylor Company at Cumberland, returning to the Baltimore & Ohio in October, 1910, as storekeeper at Connellsville, Pa., from which place he was transferred on July 1, 1913, to Washington, Ind. On April 1, 1914, he became district storekeeper of the Baltimore & Ohio and the Cincinnati, Hamilton & Dayton, with office at Cincinnati, Ohio; in January, 1917, he was appointed chief clerk to the general storekeeper of the Baltimore & Ohio at Baltimore, and in May, 1918, he became chief clerk to the purchasing agent at that place. Mr. McQuilkin was appointed assistant general storekeeper in June, 1918, with headquarters at Baltimore, from which position he was promoted to that of general storekeeper, as noted above.

OBITUARY

Charles Carney, formerly supervisor on the Illinois Central, with headquarters at La Salle, Ill., died at his home in Chicago on June 21, at the age of 64 years.

EXPORTS OF RAILWAY TRACK MATERIAL IN APRIL

Exports of rails amounting to 60,463 tons, valued at $3,416,590, showed an increase over March, but did not reach as high totals as in January or February. Exports during April of railroad spikes amounting to $413,292 and of switches, frogs, etc., amounting to $1,063,437, were, on the other hand, considerably greater than for any of the preceding months of the year. The figures in detail as compiled by the Division of Statistics of the Bureau of Foreign and Domestic Commerce were as follows:

Countries	Railroad spikes		Rails of steel		Switches, frogs, splice bars, etc.
	Pounds	Dollars	Tons	Dollars	Dollars
Belgium	.....	.....	3,802	197,098	21,116
Denmark	.....	.....	200	13,163	1,007
France	4,746,100	267,761	15,153	859,483	645,152
Italy	.....	.....	.....	.....	33,750
Norway	3,254	183	40	2,598	203
Portugal	.....	.....	.....	.....	725
Spain	.....	.....	646	32,755	19,734
Sweden	405	54	.....	.....	.....
England	.....	.....	1,581	90,530	5,404
British Honduras	1,000	52	.....	.....	28
Canada	118,387	3,908	10,717	429,015	61,700
Costa Rica	100	10	.....	.....	375
Guatemala	10,000	500	.....	.....	1,797
Honduras	16,760	805	121	8,275	.....
Salvador	16,200	892	2	188	34
Mexico	200,537	8,525	152	8,559	2,683
Newfoundland and Labrador	22,400	1,142	.....	.....	.....
Barbados	.....	.....	.....	.....	402
Jamaica	20,000	1,000	.....	.....	1,308
Trinidad and Tobago	.....	.....	179	12,555	1,009
Other British West Indies	.....	.....	.....	.....	486
Cuba	147,711	7,261	7,133	382,287	97,139
Dutch West Indies	5,852	448	.....	.....	.....
French West Indies	600	32	2	204	2,606
Haiti	28,000	1,170	.....	.....	11,350
Dominican Republic	2,000	123	.....	.....	765
Argentina	12,184	785	.....	.....	338
Brazil	270,000	14,820	631	47,700	6,359
Chile	172,656	10,173	5,404	337,441	48,082
Colombia	21,110	994	158	11,174	7,806
Ecuador	2,000	92	.....	.....	220
British Guiana	44,600	2,277	209	10,290	7,414
Peru	29,030	1,619	192	15,040	7,456
Uruguay	.....	.....	.....	.....	225
Venezuela	20,000	965	.....	.....	637
China	285,000	11,458	901	59,664	.....
Japanese China	.....	.....	2,581	193,964	17,550
British India	.....	.....	516	36,231	4,554
Dutch East Indies	326,448	31,574	1,219	59,779	31,374
Hongkong	1,028	49	44	2,989	269
Japan	522,188	19,429	6,375	462,708	10,104
Russia in Asia	732,800	23,687	1,225	59,441	7,625
New Zealand	4,480	260	139	8,925	487
Philippine Islands	.....	.....	777	54,822	3,157
British West Africa	16,800	1,244	.....	.....	.....
British South Africa	.....	.....	100	6,417	.....
Egypt	.....	.....	264	13,295	1,008
Total	7,799,630	413,292	60,463	3,416,590	1,063,437

CONSTRUCTION NEWS

The Athabasca, Grande Prairie & Fort Vermillion has been incorporated in Canada with $1,500,000 capital to build a railway from some point at or near the junction of the Solomon river with the Athabasca in the province of Alberta northwest to a point near the junction of the Smoky river with the Muskeg river in the same province and passing through the Grande Prairie district north to Peace River Landing and terminating at Old Fort Vermillion, about 60 miles. The incorporators are Charles A. Barnard, William K. McKeown, Lorne C. Herdman, Thomas G. Potter and George E. Chart, all residents of Montreal, Que.

The Chicago, Burlington & Quincy has let a contract to the Wells Brothers Construction Company, Chicago, for the construction of the superstructure of a viaduct in Canal street, Chicago, in conjunction with the building of the new Union Station. Three team tracks will be placed under Canal street and the street traffic will be carried for 800 ft. on a viaduct over these tracks. The viaduct will be 100 ft. wide with a 70-ft. roadway and 20-ft. and 10-ft. walks at the sides. Work on the caissons for this structure was started November 15, 1917, and completed May 15, 1918, involving the construction of 120 caissons.

The Chicago Union Station has awarded contracts to the Bethlehem Steel Company, South Bethlehem, Pa., for a quantity of frogs, switches, and approximately 200 tons of 130-lb. rail. The total value of the contract is approximately $50,000. The Joliet Bridge & Iron Company, Joliet, Ill., has also been awarded a contract for approximately 650 tons of steel to be used for the construction of the superstructure of a foot subway in connection with the South Canal street viaduct. The contract for the construction of the Taylor street superstructure was recently awarded the George A. Fuller Company, New York.

The Eastland, Wichita Falls & Gulf has awarded a contract to Maney Brothers & Company, Oklahoma City, Okla., for the construction of a road approximately 100 miles long from May, Brown county, Texas, to New Castle, Young county, Texas, passing through Rising Star, Mangam, Eastland, Wayland, Park Field, Breckenridge, Crystal Falls and Murray. Grading for the new road is now in progress north and south from Eastland, the grading contracts calling for 18,000 cu. yd. per mile. The road will have maximum grades of 0.75 per cent south of Eastland and 1 per cent north of Eastland. At the present time approximately 140,000 cu. yd. of the grading has been completed. O. B. Colquitt, Dallas, Texas, is president of the new road, and C. H. Chamberlin, Eastland, Texas, is chief engineer.

The North-West Route, Limited, is the name of a company recently incorporated under a bill passed in the Canadian House of Commons, with $1,000,000 capital, to build a line in the Canadian Northwest. The incorporators are Sir John Keltie, Thomas L. Gilmur, Bernerd Spring-Wright, Ernest S. Hulmwood, all Englishmen. The headquarters of the new company will be in London, Eng. The plans call for building a railway from Baker Lake, North-West territory, northwest to Schultz Lake and from a point near the junction of the Hanbury and Thelon rivers in a westerly and southwesterly direction to a point at or near Old Fort Reliance at the eastern end of Great Slave Lake, a distance of about 100 miles.

The Pennsylvania Lines will construct a group of repair shops at Stark, Ohio, consisting of a locomotive erecting shop, heavy and light machine shops, tank shop, flue shop, reel and pipe shop, blacksmith shop, firing-up shed storehouse, office building, rest house and shed for the storage of miscellaneous material. A portion of these buildings are already under contract and bids have been requested on the balance of the buildings or will be requested in the near future. The buildings with the exception of the rest house, office building and storehouse, which are of brick and timber construction, and the firing-up shed, which is of reinforced concrete construction with steel frame and brick exterior walls carried on concrete foundations.

The Public Service Commission of Pennsylvania, acting on complaints of the State Highway Department, has ordered the abolition of six highway grade crossings, one each at Girard, at Martin's Creek Junction, at Port Clinton, and at Youngsville, Warren county, and two at Dallas. In each case the commission apportions the shares of the expense to be borne respectively by the county, the state, the township and the railroad company.

The Texas & Pacific has prepared plans for the construction of a divisional terminal at Eastman, Texas, at an approximate cost of $500,000, but as yet no authority has been issued for its construction.

TRACK SUPPLIES

The Belgian Government has ordered 8,000 tons of rails from the Algoma Steel Corporation.

The Canadian Government has ordered 10,000 tons of rails from the Algoma Steel Corporation.

RAILWAY SUPPLIES IN MEXICO

The Railway Business Association has issued in pamphlet form an article by P. Harvey Middleton, executive assistant of the association, on his recent trip to Mexico to investigate railway conditions in that country. This is supplemented by an extended list of materials which are to be purchased by the Mexican Government railways for the lines south of Mexico City. Items in the list of interest to the maintenance of way department are given below.

Quotations for these items will be requested either by Silviano Pruneda, purchasing agent, Estacion Buenavista, Ferrocarril Mexicano, Mexico, D. F., or by F. P. de Hoyos, general agent, Mexican Government Railway Administration, Woolworth Building, New York.

	Requisition numbers
6,500 tie plates	113-CV, AC-2751
2,000,000 sq. ft. pine	CE-75, AC-4163
1,000,000 sq. ft. oak	CE-75, AC-4163
1,000,000 sq. ft. miscellaneous lumber	CE-75, AC-4163
*1,000,000 cross ties, standard gage	CE-75, AC-4163
*500,000 cross ties, narrow gage	CE-75, AC-4163
72 wheels, handcar	AG-309, AC-3945
2,480 pairs tie plates	155-AC, 3784
800 chisel points	AG-543, AC-2008
50 water barrels	AG-359, AC-4059
Picks, bars, jacks, etc	363, AC-4062
13 windows various sizes	589-VC, AC-4025
2,100 pieces pipe, screw, lap welded	AG-210, AC-3680
50 cases pure turpentine	AG-379, AC-4142
Adzes, axes and handles	AG-346, AC-4003
Blocks and tackle	AG- 793
45 window glasses of various sizes	451-CV, AC-3523
50 levels	AG-182, AC-3590

*Ties are usually bought in the Mexican market.

The projected railway in Finland from Rovaniemi, on the Arctic circle, north of the Gulf of Bothnia, to Petschenga, on the Arctic ocean, has been left in abeyance for some time, but is now to be proceeded with. The scheme originally emanated from the Russian Government. The North Railway went only as far as Rovaniemi, whence there remains a distance of about 300 miles to Petschenga, 120 miles as far as Kyro, and 180 miles on to Petschenga. The preliminary road, which was to precede the railway, has been almost completed from Rovaniemi, past Sodankyla to Kyro. It has a breadth of about 35 ft., half of which is intended for the future railway. The revolution stopped progress, at least as far as this Russian section is concerned. Finland, however, proceeded with the work, after the country's occupation by German troops, under the management of German officers, and a light railway was constructed as far as Kyro. The part played by the Germans in Finland then came to an end, but there is now a possibility that England will step in.

FOREIGN RAILWAY NEWS

The Government of Admiral Kolchak has decided to begin the construction of a railway from Krasnoufimsk (west of the Urals) to Tomsk, western Siberia, a distance of over 800 miles. This line, which is intended to relieve the Siberian Perm-Samara railways, should greatly contribute to the development of the productive forces of Siberia and the Urals.

The Assembly of Antioquia, Colombia, has approved the first project law, which orders the outline of the railway between a point on the Amaga Railway and the Department of Caldas, passing through Fredonia and other municipalities of the southwest, where agriculture is the chief source of traffic. This project law authorizes the governor to arrange a loan of 5,000,000 pesos.

The Australia administration of the Federal Railways is studying schemes to connect north and south by a line from Hergott Springs to Port Darwin. The proposed line would have a total length of about 1,600 miles. At Hergott Springs, in the South, it would connect with the existing line to Adelaide, which is 200 miles farther south. Port Darwin, the northern terminal, is in the Northern Territory.

One of the new Mexican projects for which application for concession has been made is for a railroad between Tampico and Tuxpam, a distance of about 125 miles. Among the corporations that are interested in the building of the proposed line are the Mexican Petroleum Company and the Eagle or Aguila Oil Company. While the line will be primarily for the purpose of affording transportation for supplies and materials for the different oil fields, it will do a general freight and passenger business.

The special commission in Sweden has recently submitted an elaborate report for the improvement of the railway terminals of Stockholm. The ultimate expenditure is estimated at from $25,000,000 to $30,000,000. The improvements include a west trunk line through part of Sodermalm with a tunnel under Maria Hill and viaduct across Lake Malaren and a bridge across the Norrström with a large central station to replace the present main station. It is believed the project will be completed by about 1927.

The Cananea Copper Company and other American interests in Mexico have filed application for a concession to construct a railroad from Cananea to Bahia Roca, a prospective deep-water port on the Gulf of California. The route of the prospective line is through a part of the state of Sonora that is rich in undeveloped mineral resources. The distance between Cananea and Bahia Roca is about 175 miles. At present the only railroad reaching Cananea is the one which runs down from the Arizona border.

A proposal is being considered in Australia of building a railway from the Northern Territory to the border of Queensland or continuing the Great Northern Railway to Camoweal or Lake Nash. The Queensland line is now at Dajarra. The route has not been surveyed, but the distance would probably be about from 120 to 150 miles, and with the exception of the first 10 miles from Dajarra the country presents no engineering difficulties. It may perhaps be found preferable to connect from the Great Northern line from Dobbyn by an extension through Mount Oxide, and Gregory Downs to the border north of Camoweal.

Among the post war problems connected with the "clearing up" of the war areas is that of the disposal of the military railways. Both the British and American authorities have been willing to allow France to retain such lines as may be required for ordinary commercial purposes or would be of use during the period of reconstruction, but a good deal of the mileage is not required by the French Government. This applies to both standard and narrow gage track. An allied commission is now to investigate the whole question. This commission will have plenary powers to decide on the future of all the railways constructed in France by the British and American armies for war purposes, and the surplus track, etc., will be offered to the world's buyers.

The President of Peru has been authorized by Congress to obtain a loan of $1,500,000, gold, at 7 per cent annual interest and an accumulative annual amortization of one per cent, to be used in the construction of the Jatunhuasi Railroad.

President Carranza on June 6 sent a message to the Mexican senate, asking Congress to authorize the national executive to construct three railways connecting undeveloped regions of Mexico with those already developed. The first railway suggested by the president would connect a point between Magdalena and Hermosillo, in the State of Sonora, with Ensenada, in lower California. The second would unite the town of Peto, Yucatan, with Bacalar and Santa Cruz, in the territory of Quintana Roo. The third line suggested would connect Santa Lucrecia, in the State of Vera Cruz, with the State of Campeche, which has no railways.

In the State of Sao Paulo, Brazil, plans are under consideration for the construction of a new railroad. The proposed line is to extend from Pederneiras, through Agua Limpa, Saturno and Poco Alcalino de Quilombo, to the Batalga river at Rainha dos Anjos do Batalha, hence northwest to Miguel Calmon, traversing about 70 miles through a very fertile region, rich in woods. It is also planned to run a railroad line which will connect the three mountain towns, Petropolis, Therezopolis and Friburg. The president of Brazil recently specified the dates for the construction and delivery of the following railway lines: From Sao Sebastiao do Paraiso to Passos, December, 1920; the Biguatinga to Jacuhy extension, February 24, 1921; and November 15, 1921, for the Pratinha to Santa Rita de Cassia branch, and the extension from Passos to kilometer 24.5 toward Sao Jose de la Barra.

The Kansas City, Mexico & Orient system is to be extended in Mexico just as soon as provisions can be made by the company for resuming construction work. At the time the revolutionary period began, nearly nine years ago, the main line of the Kansas City, Mexico & Orient was getting well along toward completion. Two unfinished gaps in Mexico and a 50-mile stretch of country in Texas are all that are lacking to make the line complete between Kansas City, Mo., and the port of Topolobampo, on the Pacific coast. The division which runs from Chihuahua to Marquez lacks only 75 miles of reaching the Rio Grande. From Chihuahua the track of the Mexico Northwestern is used as far as Sanchez. The next division is from Ojo del Buey to Los Hornillos. Then follows another unfinished gap to Fuerte. From Fuerte to Topolobampo the road has been in regular operation for several years. The company has made application to the department of communications and public works for a concession to construct branch lines to Guadalajara, San Luis Potosi, Aguas Calientes and a number of other cities and towns.

The Greek Government has sanctioned the construction of certain work and other improvements on the Piraeus-Athens-Larissa and Salonika railway, which will cost 35,000,000 fr. ($7,000,000). The work has already begun. A number of short tunnels, the length of which in all is about 1,300 meters, and eight or ten bridges, each 10 meters in length, are being constructed to improve the section between Athens and Larissa; while steel and concrete bridges between Papapouli and Topsin, on the Larissa-Salonika line will involve an expenditure of 4,000,000 fr. ($800,000), and will require 1,000 tons of steel. They will be constructed in Greece with the exception of two, which have been ordered in Europe (the country is not mentioned). About 400 large houses will be built along the line for the railway officers, attendants and workmen; also workshops and engine sheds at the Piraeus, Lianocladi & Larissa. In the meantime the reconstruction and repairs of the Serbian railways, so badly damaged or destroyed by the war, are progressing. The trains run now as far as Uskub, and it is hoped that within a month or two the remainder of this line will have been repaired and thus the union of the Greek and European railways will be effected.

SUPPLY TRADE NEWS

The Ball Engine Company of Erie, Pa., manufacturers of the Erie railway ditcher, awarded a contract on June 18 for the construction of an addition to its erecting shop. The new building will be approximately 175 ft. by 125 ft. in area.

The Bordon Company, Warren, Ohio, manufacturers of the Beaver die stocks and die cutters, has opened a downtown Chicago office at 549 West Washington street, in charge of Charles A. Green, Chicago representative.

The Duntley-Dayton Company, Chicago, has taken over the sales agency for the Red Devil rivet cutting guns, made by the Rice Manufacturing Company, Indianapolis, Ind., for all territory east of the Rocky mountains.

The Massey Concrete Products Corporation, Chicago, has purchased a 23-acre tract at 135th street on a joint right-of-way of the Indiana Harbor Belt, the Baltimore & Ohio Chicago Terminal and the Chicago, Rock Island & Pacific, upon which a car construction and car repair plant will be built.

The Blaw-Knox Company, which recently sold its plant at Wheatland, Pa., will concentrate its entire manufacturing activities at its plant at Hoboken, Pa., which is being greatly enlarged. The complete plant at Hoboken will employ about 1,200 men and occupies a site covering 50 acres. Further developments at this plant include the purchase of 15 acres for th construction of workingmen's homes.

The Allied Steel Castings Company, Harvey, Ill., which is controlled by the Chicago Malleable Castings Company and the Universal Draft Gear Attachment Company, Chicago, will install a 10-ton open hearth furnace to supplement the present Wellman-Seaver-Morgan 5-ton tilting furnace, which will be enlarged.

The McMyler Interstate Company, Cleveland, Ohio, makers of car dumpers, locomotive cranes, ore and coal handling machinery, scraper and railroad equipment, with works at Bedford, Ohio, and at Warren, Ohio, has opened a branch office in the Merchants Exchange building, San Francisco, Cal., with **L. A. Somers** as district representative.

The manufacture and sale of Lundie tie plates, up to this time handled by John Lundie, 52 Broadway, New York, has been taken over by the Lundie Engineering Corporation, at the same address, with the following officers: John Lundie, president; Percy Holbrook, vice-president; Eugene Brandeis, treasurer, and R. W. Crawford, secretary. The Chicago office at 30 North La Salle street is in charge of C. Z. Moore, manager of sales.

The Central Steel Company, Massillon, Ohio, has opened new offices in the Book building, Detroit, Mich. **Arthur Schaeffer,** assistant director of sales, with headquarters at Massillon, has been promoted to district manager of sales and will be in charge of the new offices with **Frank Gibbons** as assistant. Mr. Gibbons, who has just joined the organization, has been in the employ of the Carbon Steel Company for five or six years and for the past several months has been district sales manager of the Detroit office.

The semi-annual meeting of the Material Handling Machinery Manufacturers' Association was held Wednesday, June 11, at the Hotel Astor, New York. The aims of the organization are to obtain co-operative publicity for the manufacturers and users of material handling machinery and to show the general public that such machinery is a benefit to them. The manner in which these aims are to be realized are outlined and discussed and it was decided that technical magazines and moving pictures would afford the desired means.

Following the return of Fred A. Poor, president of **The P. & M. Company,** Chicago, from a six weeks' trip abroad, announcement has been made of the organization of the P. & M. Company (England), Limited, with offices at 31 Budge Row, London, E. C. This company has acquired license under patents held by L. P. Winby & Company of London and Gillespie Partners, Limited, of London, as well as under all the foreign patents held by The P. & M. Company of Chicago. L. P. Winby, formerly of L. P. Winby & Company, Queen Anne's Chambers, Westminster, London, S. W., will be the managing director of The P. & M. Company (England), Limited. The other directors are F. C. Winby and Fred A. Poor.

The Carter Bloxonend Flooring Company, Kansas City, Mo., has been formed to take over the manufacturing and selling interests in Bloxonend flooring formerly held by the C. J. Carter Lumber Company, Kansas City, Mo., the Doniphan Lumber Company, Kensett, Ark., and the Marsh & Truman Lumber Company, Chicago. The Kansas City office will be under the direction of C. J. Carter, president, and Mabry Mellier, vice-president, will have charge of sales. The sales office in the McCormick building, Chicago, will be in charge of M. G. Truman as vice-president, who will also have charge of the selling interest to railroads, with principal operating offices at St. Paul, Minneapolis and Duluth. The Builders' Material Supply Company, New York, will continue as mail agents for the new company in the New York district for all other than railroad business. The manufacturing plant of this company will be located at Kensett, Ark.

At the initiative of the **American Concrete Pipe Association** a joint committee has been organized for the study of specifications for concrete culvert pipe to be composed of one representative from each of six associations which were invited to participate. All of these have appointed members except the American Society of Civil Engineers, which is still to be heard from. Members of the committee appointed thus far include Paul Kircher, sales engineer, Massey Concrete Products Company, Chicago, representing the American Concrete Pipe Association; T. R. Agg, Iowa State College, representing the American Association of Highway Officials; F. L. Thompson, chief engineer Illinois Central, Chicago, representing the American Railway Engineering Association; B. S. Pease, American Steel and Wire Company, Chicago, representing the American Concrete Institute; H. P. Shelley, assistant engineer, sewer construction department, city of Philadelphia, representing American Society for Testing Materials. The first meeting of this committee will be called at Atlantic City on June 27.

PERSONAL

Colonel Frederick A. Molitor has returned from military service overseas and has resumed his practice of engineering at 34 Nassau street, New York.

Harold E. Wade has been appointed president of the Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn., succeeding **Frank E. Wade,** deceased.

Preston Belvin has been appointed district sales engineer of the International Oxygen Company, Newark, N. J., in charge of the Pittsburgh district sales work, with office at Pittsburgh, Pa.

Major John L. Wood, formerly connected with the Buckeye Steel Castings Company, Chicago, and interested in several railway supply companies, among them the Edwin S. Woods & Co., Chicago, died at Pasadena, Calif., after a protracted illness.

Lieut. E. D. Stearns, who served in the aviation corps of the United States Army, has been appointed sales manager of the H. K. Ferguson Company, Cleveland, Ohio. Before entering military service, Lieut. Stearns was a partner of the Fort Pitt Engineering Company, Pittsburgh.

Col. E. J. Hall, first vice-president of the Hall-Scott Motor Car Company, San Francisco, Cal., recently received the distinguished service medal from the government, by reason of his having designed the major portion of the liberty motor and also having an excellent record as chief of the Technical Section, Air Service, in charge of aviation engi-

neering, inspection and acceptance of airplane parts and equipment with the A. E. F. in France, England and Italy.

P. Harvey Middleton, for seven years executive assistant of the Railway Business Association, has resigned to accept a position with the foreign trade department of the Guaranty Trust Company, New York. Mr. Middleton took up his new duties on June 16.

E. G. Buckwell, secretary and manager of sales of the Cleveland Twist Drill Company, Cleveland, Ohio, sailed on May 12, for a three or four months' tour of Europe. He is making an investigation of trade conditions throughout England and the continent.

E. A. Hitchcock has been elected vice-president of the Bailey Meter Company, Cleveland, Ohio. He will supervise the training of technical graduates for the company's service and sales departments. During the past six years he has been connected with the E. W. Clark & Co. Management Corporation, as advisory, consulting and power sales engineer. Previous to that time he was professor of experimental engineering at Ohio State University.

J. W. McCabe, until recently district manager of sales at Buffalo, N. Y., for the Chicago Pneumatic Tool Company, Chicago, has been appointed special representative for the company's foreign trade department and will leave shortly for an extended trip throughout the Orient, the Philippine Islands and Australia. **W. H. White** has been appointed acting district manager of sales at Buffalo to take charge of that territory during Mr. McCabe's absence.

Jay L. Hench, assistant district sales manager of the Lackawanna Steel Company, at Chicago, has been promoted to district sales manager, with headquarters at the same point. Mr. Hench was born at Hinsdale, Ill., on April 11, 1885, and after graduation from the high school of that place, entered Cornell University in 1903, in which institution he specialized in iron and steel metallurgy. He began his business career in the fall of 1905, at which time he entered the employ of the Illinois Steel Company in its south works at South Chicago, Ill., where he was engaged for one year in practical work in the open-hearth and Bessemer departments of that plant. The following five years he was in the employ of Joseph T. Ryerson & Son, Chicago, most of which time he was acting in the capacity of sales repreeutative in Indiana and Michigan, with headquarters at Chicago. He resigned from that position in 1911 to enter the service of the Lackawanna Steel Company, with which company he was assistant district sales manager, with headquarters at Chicago, prior to his recent promotion.

J. L. Hench

W. G. Balph has been appointed manager of the Safety Switch section of the Westinghouse Krantz Factory, Brooklyn, N. Y. As head of this section, Mr. Balph will have entire responsibility for the sale of all Krantz products, and, in addition, will have charge of the extension and development of this company's line of safety switches. Prior to working as salesman in the New York office, Mr. Balph was head of the Fan Motor division, with offices at East Pittsburgh, Pa.

Major J. L. Terry, formerly of the St. Louis office of the Q and C Company, New York, and now with the American Expeditionary Forces, Transportation Service, with headquarters at Rennes division, France, expects to return home in the near future. **Lieut. L. T. Burwell** and **E. C. Zimmerman,** both of the New York office, are out of military service and back in their old positions, traveling out of New York, and **Lieut. C. M. Brennan** is also out of the service and is again located with the Chicago office.

Albert C. Mann, purchasing agent of the Illinois Central, with headquarters in Chicago, has resigned to become vice-president of the American Internation Steel Corporation, with headquarters in New York.

D. E. Sawyer has been appointed general manager of sales of the Pollak Steel Company, Cincinnati, Ohio, with headquarters at New York, effective July 1. Mr. Sawyer was formerly connected with the Illinois Steel Company, and assistant steel director of purchases of the War Industries Board.

Jno. T. Mahoney, purchasing agent of the Buda Company, Chicago, with headquarters at Harvey, Ill., has been promoted to sales manager of the truck and tractor engine department, to succeed **Lon R. Smith,** who has resigned to become general sales manager of the Midwest Engine Company, Indianapolis, Ind.

TRADE PUBLICATIONS

Force Pumps.—The Humphryes Manufacturing Company, Mansfield, Ohio, has issued the first of a series of bulletins illustrating and describing its new types of pumps. These bulletins are 7½ in. by 10⅝ in. in size and are punched for standard ring or post binder. They contain essential data and dimensions of the different types of pumps described.

Specifications for Manganese Crossings.—The Balkwill Manganese Crossing Company, Cleveland, Ohio, has just issued specifications for its articulated cast manganese crossings accompanied by standard detailed drawings for crossings at various angles, for heavy and medium duty and for three hole and two hole drilling.

Cement Gun Work.—The Cement Gun Construction Company, Chicago, has issued Gunite Book No. 6, containing 24 pages, illustrative of the structures which have been treated with the Cement Gun process for the application of a coating of "gunite" to produce wall, wall roof and floor surfaces or to protect structural steel against corrosion.

Electric Traveling Cranes.—The Chesapeake Iron Works, Baltimore, Md., manufacturers of electric traveling cranes, has issued a 30-page loose-leaf booklet devoted to descriptive cuts and specifications of the various standard parts comprising the cranes and views of typical installations. The booklet is attractively prepared and is bound in heavy manila cover in such a way that other pages may be added from time to time.

Pneumatic Tools.—In a temporary catalogue, containing 48 pages, issued pending the publication of a larger book, the Keller Pneumatic Tool Company, Grand Haven, Mich., shows briefly its line of pneumatic tools, including valve and valveless types of rotary and piston drills, which are new additions to the line. All models of Keller-made chipping hammers, riveting hammers, holders-on, dolly bars, jam riveters and sand rammers are illustrated and described, with detailed specifications and information as to the uses for which each is designed. This company has also published a four-page folder containing a list of its special tool making and production equipment, with a few illustrations of representative operations and productions.

The heaviest snowstorms in South America in recent years have probably stopped communication between Argentina and the west coast, by way of the Transandine Railway, until spring (southern hemisphere). Snow slides have torn up the Transandine Railway at points and wrecked the bridges, making it impossible to operate the bi-weekly train between Buenos Aires and Valparaiso. Officers of the Transandine Railway state that it will hardly be possible to repair the road before the spring months of September or October. The blocking of the Transandine Railway by snow slides is practically an annual occurrence. In 1912, 1914 and 1915 the road was inoperative for 140, 188 and 141 days, respectively.